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INTERNATIONAL FIRE FIGHTER

Reporting Worldwide to Municipal, Industrial and Fire Training Professionals



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Official International Journal

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February 2006 Issue 9



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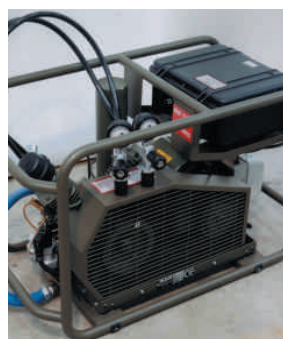
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6 - 10 May 2006

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Manama, Kingdom of Bahrain

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H.E. Shaikh Rashid bin Abdulla Al Khalifa
Minister of the Interior

FDIC LAUNCHES IN THE MIDDLE EAST

The Fire Department Instructors' Conference (FDIC), the world's largest and most prestigious annual exhibition, conference and H.O.T. (Hands-On-Training) programme specifically designed to meet the needs of fire fighters, is coming to the Middle East. This exciting new event in Bahrain, will present anyone involved in the business of fire fighting in the Middle East with new opportunities to:

- **Train** under the expert guidance of some of the world's best, most experienced instructors in the highly realistic H.O.T sessions.
- **Learn** about the latest thinking on command and control of major fire related incidents in the world-class conference.
- **Exhibit** and showcase the latest services, technologies and equipment to potential clients across 7000 sq mtrs of exhibition floor attracting professionals from the petrochemical, aviation and industrial fire and security sectors, from Civil Defence Forces throughout the region, from local authorities, government agencies and from private companies involved in fire.
- **Network** with key industry personnel all located under one roof, making FDIC Bahrain 2006 a one-stop-shop for the fire sector in the Middle East.

For all professionals involved in the fire industry, FDIC Bahrain 2006 is a must attend event. Ensure you don't miss this opportunity to train, learn, meet new clients, develop business leads for the future and discover the prospects this industry has to offer within the Middle East region.

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For more information:

Web: www.fdicbahrain.com

E-mail: Glenn Ensor on glenne@pennwell.com

Tactical fire fighting training facility at Chiltern Fire

Buckinghamshire Fire & Rescue Service and its colleagues in Oxfordshire have signed up for tactical fire fighting training at a new facility launched by CHILTERN INTERNATIONAL FIRE.

This is a new venture for Chiltern Fire, which has more than 20 years' experience of research into fire behaviour. 'Training has always been an integral part of our services and we appreciate the need to create situations which are as close to real life as possible,' said Senior Engineer James Lavender.

The new facilities at Chiltern Fire's headquarters near High Wycombe, Bucks, are 'first class', according to Greg Smith, Training and Development Manager for Buckinghamshire Fire & Rescue Service. The new facility can cater for Positive Pressure Ventilation (PPV), Breathing Apparatus (BA) and Compartment Fire Behaviour training, as well as outdoor exercises and drills.

The facilities comprise: a two-storey residential house with three 'bedrooms', two accessible entry points and an inclined roof, accessible for working at heights; a 40ft demonstrator unit and 40ft attack compartment for compartment fire behaviour training; and a spacious fire ground for outdoor exercises and drills, with generous appliance parking. Mr Lavender added, 'The training environment is flexible and can be tailored to trainees' needs. Its location close to the M40 is a major plus for fire authorities within a radius of London and the Home Counties.'

The facility was originally developed as part of research conducted by Tyne & Wear Metropolitan Fire Brigade to establish and monitor the changing internal environment during deployment of PPV. Chiltern Fire has



since worked closely with Buckinghamshire to further develop the facility for PPV training.

Greg Smith said: 'This facility will enable us to train firefighters in the practical use of positive pressure ventilation techniques, which will enhance the safety of crews in the hazardous fire-fighting environment in buildings and enable them to locate casualties more easily and quickly.'

'We look forward to working with Chiltern Fire and building on our already positive working relationship which has built up over a number of years.'

Chiltern Fire will carry out risk assessments, in conjunction with users' own training officers, and will monitor all internal training environments for gas temperature and concentrations, so that the training team can better interpret the results. Real time graphical displays can be provided for debriefing sessions.

For further information contact:
Philip Howard on 01494 569800 or
Email phoward@chilternfire.co.uk

New Angus Portable Fire Pumps

ANGUS FIRE has extended its range of portable pumps for fire and rescue professionals with the introduction of several new air-cooled models. The company now offers one of the widest range of portable pumps specially designed for today's demanding fire fighting and flood relief applications. The new models are lighter and more compact than traditional water-cooled pumps of the same output and so free up valuable locker space and save weight on fire appliances. They combine simplicity of operation with dependable performance without interruption hour after hour, time after time. High performance petrol or diesel engines of 12 to 35 hp are designed to provide flow rates of 550 to 1200



litres/minute at 7 bar pressure. Electric start is standard with hand start back-up, and innovative design and engineering allows dirt and stone particles to pass through the pumps without causing damage. All models are manufactured to ISO 9001:2000 from tough corrosion-resistant materials for long operating life and minimal maintenance. They meet European and US CARB and EPA exhaust emission standards and comply with European noise emission Regulation EN 12100-2. In addition to the latest air-cooled models, the company offers traditional water-cooled models with power ratings of 41 to 60 hp and flow rates of 1400 to 2300 litres/minute at 7 bar pressure.

To download PDF data sheets on all Angus Fire portable pumps visit:
www.angusfire.co.uk



Glow Baton® Model 50 Traffic Control Pro . . .



. . . allows First Responders to safely direct people and traffic around and out of emergency situations. It can also be used as a roadside flare with the included stainless steel stand, eliminating fire and other hazards of regular flares. The affordably priced Glow Baton® is lightweight, weighing on 7 oz, and is easy to use, 12" overall length, with slip resistant handgrip and push button operation. 360° light is visible from all directions. High impact, water resistant tube with bright red LED makes Glow Baton® virtually unbreakable. One 9V alkaline battery provides hours of continuous glow.

Made in the U.S.A. For more information call:
Grace Industries at (800) 969-6933 or visit
www.graceindustries.com

Maintenance-free personal monitoring for two years with new Draeger Pac 5000

With an event logger for computer downloading, the new Draeger Pac 5000 single gas instrument is ideal for use by those with a need to carry out regular personal monitoring and to record the results. Easy to use and completely maintenance-free for two years, it ensures reliable monitoring of ambient air and is designed to detect carbon monoxide, hydrogen sulphide or oxygen.

As the latest addition to the DRAEGER SAFETY range of innovative single gas instruments, the Pac 5000 can be viewed at www.draeger-safety.co.uk/PAC.

Featuring a back-lit liquid crystal display which continuously shows the gas concentration in large digits, this small, robust unit incorporates the new Draeger XXS sensors. These sensors, which do not have to be replaced during those two years, ensure extremely short electrochemical reaction times and enable the unit to respond immediately to any gas hazard.

Equipped with vibrational, visual and two-tone audible alarms which are activated as soon as the threshold levels are reached, the Pac 5000 also emits an alarm before the end of the instruments' useable life and before the end of the battery capacity. Depending upon the selected configuration, the pre or main alarm can be acknowledged.

Configuration, calibration and downloading of the event logger can all be carried out quickly



and easily via the infra-red interface, and the event logger can store up to 60 events.

Downloading the stored data, complete with date and time, can be carried out via a PC using Pac Vision, CC Vision or Gas Vision software. An adjustable operating timer function can also be accessed with this software to allow changes to a number of specific operations such as calibration due date, inspection due date or a special out of order date.

For maximum reliability, the language-free display also features a bump test icon that informs the user as and when a function test is required. The bump test period can be adjusted by the user and performed either manually or automatically, the result being stored in the event logger. This can be easily carried out with

a Draeger Bump Test station.

Several instruments can also be configured and calibrated at the same time with the Draeger E-Cal system.

Protected by a tough, rubber housing and meeting the requirements of IP65, the Pac 5000 is easily fastened to workwear by way of a secure crocodile clip.

Full details can be found at

www.draeger-safety.co.uk/PAC

Further information is available from Richard Beckwith, Draeger Safety UK Limited, Ullswater Close, Kitty Brewster Ind Est., Blyth, Northumberland NE24 4RG
Tel: 01670 352891
Fax: 01670 356266

RAPPEL is rolling out across the UK

Five Fire Services across the UK have decided to strengthen their IT systems and to improve management of their retained resources with RAPPEL, FORTEK's Crew and Appliance Availability Planning tool.

The solution is currently being implemented in 40 pilot stations across the country, and by the end of the spring over 100 Fire Stations will be using RAPPEL to provide them with real time resource availability information.

RAPPEL is a simple, yet effective solution for managing both current and future crew and resource availability. It is a real time solution enabling Services to monitor availability and easily forecast resource shortfalls, enabling better informed operational readiness within their area. Status changes are made by individual crew members dialling a pre-programmed telephone number. RAPPEL also provides retrospective analysis and reporting facilities for the collation of management information.

Further information:

Tel: +44 (0) 23 9251 0088

Fax: 44 (0) 23 9251 0626

Website: www.fortek.co.uk

New Range Offers Safe Containment Of Contaminated Water

A range of bladders, to assure the completely safe containment of contaminated water collected during the decontamination process, is being offered by PROFESSIONAL PROTECTION SYSTEMS. Manufacturers and suppliers of the NHS standard decontamination shower as well as mass decontamination units for HM Government PPS equipment is deployed daily by emergency services all over the world.

The bladders come in 500, 1000 and 6000 litre sizes. All three units are made from the same heavy-duty inflatable material, giving them an unusually tough resistance to rip, tear or puncture regardless of the terrain. Designed to be filled from the PPS waste water pump and hose all the couplings required are supplied with the units, which can be connected together to give a larger capacity if required. They include Storz couplings and a safety butterfly valve for inlet and outlet, whilst an over



500 litre bladder

pressure valve on the top cap allows air to escape as the bag fills.

Further information can be obtained from: Plys Protection Systems, Protection House, Sherbourne Drive, Tilbrook, Milton Keynes, Bucks, MK7 8AP
Tel: 01908 272240
Fax: 01908 371605
Email: sales@ppsgb.com

Cromwell Helmets

– the integrated approach to fire and rescue

Helmet Integrated Systems Ltd. (HISL) manufactures an extensive range of fire-fighters helmets and communication systems that are used internationally by fire and emergency services.

The drive towards more rigorous standards of protection, with the need to improve wearer comfort and reduce through life costs, has accelerated the development of fire and rescue helmets.

Cromwell F600

One of the key developments has been a change in helmet shape from the traditional wide brimmed style with central comb, which offered little impact and thermal protection to the side of the face and neck, to the 'jet style' which is similar in shape to that of a military aircrew helmet.

The Cromwell F600 fire-fighters helmet was one of the first to be introduced with this more modern and compact styling, including an integral face shield that could be retracts within the helmet shell.

The modular construction of the F600 introduced the added benefits of easily replaced individual components, reduced maintenance, improved hygiene and longer service life with a reduction in lifetime ownership costs.

Exceptional wearer comfort has been a significant factor in the adoption of the F600 by many fire services

New dual helmet system

Less than a third of all 'call outs' to the Fire and Rescue Services require the need for a full structural fire-fighting helmet. Other incidents not requiring this type of helmet include road traffic accidents, woodland fire fighting, water rescue, urban search and rescue and industrial incidents such as confined space rescue operations.

To meet these requirements HISL developed its new Cromwell dual helmet system featuring two helmet shells that integrate into one.

The base helmet, the Cromwell ER1, is approved for emergency and rescue operations not requiring a structural fire-fighting helmet, paramedic, water rescue and civil defence personnel would be typical examples.

Fitted with an internal goggle and a connection for optional ear defenders, the helmet can also be configured for specialised operations such as heli-deck, coastguard, air sea rescue and public security.

The Cromwell FR2 with an integral full face shield, has an internal clip arrangement enabling it to fit over the ER1 in seconds, providing additional heat, flame and impact protection to the wearer for structural fire fighting operations.

Both helmet configurations can be fitted with integral communications and neck capes, the FR2, can also be supplied with SCABA facemask fixing points.



The 'jet style' Cromwell F600

This new Cromwell helmet has been developed to meet the requirements of the planned UK Fire Services Integrated Clothing Project (ICP) and is designed to fit male and female fire and rescue personnel, across a range of ethnic groups to ensure its suitability for international use.

Universal communications

As a further option, HISL has developed the Signum communications headset, designed for quick, simple fitting into Cromwell and other manufacturers' helmets.

The new headset provides high performance and reliable RX and TX with the choice of bone conducting or boom microphones. Positioned on the crown of the wearer's head, the bone conductive microphone ensures the optimum clarity of communications, particularly when SCBA is being worn.

Lightweight and comfortable to wear, the Cromwell Signum connects to a press to talk (PTT) switch and down-lead assembly, which is configurable to most radio types

Built-in radio communications

The Cromwell Echo, firefighting and damage control helmet provides built-in intrinsically safe radio communications, with a clip-in rechargeable battery that provides up to 4 hours of use.

The Echo is unique in providing effective communications in areas where traditional radios do not work effectively; such as below decks on board ships, in underground locations, within large complex buildings or plants, and in confined spaces with high ambient noise levels.

IFF



The Cromwell ER1/FR2 dual helmet system

For more information contact:
Bob Gaskell
Tel: +44 (0) 1776 704421
or visit www.helmets.co.uk

The Fire Safety Engineering College



FSEC Academic Programs

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BSc (Hons) Fire Safety Management
BEng (Hons) Fire Engineering

Diploma of Higher Education in Well Engineering with Optional Industrial Placement

Leading to –
B.Eng (Hons)
Mechanical Engineering

Diploma of Higher Education in Facilities Management

Leading to –
BSc (Hons) Facilities Management

For further information on courses available, please contact:

Fire Safety Engineering College of Oman

P.O. Box 2511

PC 111

Sultanate of Oman

Tel: +968 24 521256

Fax: +968 24 521042

Website:

www.fsecoman.com

INTRODUCTION TO THE COLLEGE

The Fire Safety Engineering College is a private joint stock company owned by a consortium of sponsors. It is registered with the Ministry of Commerce and Industry and regulated with and regulated by the Ministry of Higher Education.

The College's objectives are:

To create in the Sultanate of Oman a cost effective international centre of excellence for the study of Fire Safety Engineering for public and private students from the Sultanate of Oman, the Gulf Region and beyond.

To create in the Sultanate of Oman a cost effective international centre of excellence for the study of Oil and Gas Drilling for public and private students from the Sultanate of Oman, the Gulf Region and beyond.

To provide a progressive system of education and training so that student fire engineers are able to achieve appropriate vocational and academic qualifications leading to local awards at Certificate and Diploma levels and to the award of degrees and higher degrees in the United Kingdom.

To provide a progressive system of education and training for oil and gas drilling personnel so that drilling personnel at all levels are able to achieve appropriate vocational qualifications and progress to programmes of Higher Education.

To introduce additional programmes as required to meet the Sultanate's needs for a qualified work force, to meet the requirements of the Ministry of Higher Education, and to further the College's professional and business objectives.

The College brings together the best purpose built facilities and staff for fire safety, oil and gas drilling training and education within the Gulf Region and is one of only a few such establishments world wide.

International accreditations

- **The University of Central Lancashire (uclan), UK:** The Fire Safety Engineering College is affiliated to the University of Central Lancashire and ensures the highest level of quality assurance that is characteristic to British Universities.
- **The International Fire Service Accreditation Congress (IFSAC), USA:** The Fire Safety Engineering College is a Voting member of both the Certificate (vocational) and Degree Assemblies. The College is accredited by IFSAC to deliver NFPA 1001 Fire-Fighter I & II, plus other NFPA standard programmes.
- **The Civil Aviation Authority (CAA), UK:** The College's Aviation Courses are inspected and approved by the Civil Aviation Authority (CAA) International Services Department.
- **The International Well Control Forum (IWCF), UK:** The Fire Safety Engineering College is an associate Member of the IWCF and is an accredited centre for the provision of Well Control Courses, tests and examinations.
- **The International Association of Drilling Contractors (IADC), UK:** The Fire Safety Engineering College is an associate Member of the IADC.
- **The American Safety & Health Institute, USA:** FSEC has recently received an official Accreditation from the American Safety & Health Institute as a Basic Life Support Training Centre.

FSEC Vocational Course Offerings

The Fire Safety Engineering College offers the following internationally recognized and accredited courses in its Vocational programme:

- Aviation Fire-Fighting
- Fire & Rescue (Aviation & Industrial)
- Risk & Safety Management
- Specialist Diploma in Disaster & Emergency Management Systems (DEMS)
- The Nebosh General Certificate in Occupational Safety and Health
- Nebosh Specialist Diploma in Environmental Management
- Specialist Combined Course Graduate Certificate in Occupational Safety & Health
- Institution of Occupational Safety & Health (IOSH) Managing Safely
- Joint IOSH & The Institute of Risk Management (IRM) Managing Risks
- Institution of Occupational Safety and Health (IOSH) Working Safely
- Institution of Occupational Safety & Health (IOSH)
- National Vocational Qualification (NVQ) Level 4 in Health and Safety or Level 5 for Regulators
- Certified Auditors Training & Security Management Training
- Vocational Qualifications of the Institute of Leadership & Management (ILM)
- Stuck Pipe Prevention, WellCAP (All Levels), IWCF Certification

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Angus Fire Supplies Foam Quickly to Multiple Storage Tank Fire

Responding quickly following a catastrophic explosion at the Buncefield oil depot, the Angus Fire Emergency Service supplied a large quantity of foam concentrate to help fire crews extinguish fires in twenty hydrocarbon storage tanks.

The Angus Fire Emergency Service was activated immediately on receiving notification from Hertfordshire F&RS at 07.05 on Sunday, December 11. Within a few hours the company despatched emergency foam stocks from its facility at Bentham, North Yorkshire, by road tanker under full police escort.



*Fire fighters apply foam at Buncefield fire.
Photo courtesy of Captured Images*

Over subsequent days the Angus Fire Emergency Service transported additional foam stocks to support firefighters at the scene. All told, the company supplied more than half a million litres of foam, mostly Angus Fire FP70.

Angus Fire's Martin Hough, who was on site at Buncefield, and Gary Godfrey, co-ordinated foam supplies and provided technical assistance. The company's foam scientist Maurice Birkill was also on hand to help with environmental and disposal issues.

Throughout Sunday and Monday foam stocks were rushed to the scene not only by Angus Fire, but also by local authority and industrial fire services all over the country. By midnight on Sunday 250,000 litres of foam concentrate were either on site or en route to the scene. High-volume water capability and a plan for water run-off were in place early Monday morning.

Foam Attack

A major foam attack was launched on Monday morning using high-capacity foam monitors including three Angus Fire Titans. It quickly became apparent that Angus Fire FP70 foam was performing extremely well. Despite working under arduous conditions fire crews extinguished fires in ten of the twenty burning tanks by midday.

Angus FP70 is a high performance foam that is

specially formulated to extinguish large storage tank fires. Its fluoroprotein-based bubble structure provides exceptional resistance to heat, enabling it to pass through flames, impact on hot fuel and move over the burning liquid surfaces. Its bubble walls are tough enough to seal tightly against the hottest tank shells, and even under a torrent of cooling water its stable foam blanket remains intact.

On Wednesday morning Hertfordshire F&RS announced that the last of the fires had been successfully extinguished. Fire crews went on to prevent re-ignition and burn back by covering the exposed fuel surfaces with a medium expansion foam blanket using Angus Fire Bund Pourers.

Roy Wilsher, Chief Fire Officer, Hertfordshire F&RS comments "The successful and relatively early resolution of this incident was due to many factors including the support of many fire services, oil industry fire fighters and companies such as Angus. The assistance given by Angus in terms of advice and bulk foam concentrate was invaluable and I am pleased to make my appreciation public".

Angus Fire has also received a letter of thanks from Jim Fitzpatrick, Parliamentary Under Secretary of State in the Office of the Deputy Prime Minister.

Track Record

This latest incident reinforces the track record which Angus Fire has established in delivering urgently needed supplies of foam and technical expertise to major incident sites world wide. Angus Fire is part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit, which provides fire safety and security solutions to more than one million customers around the world.

A dedicated emergency hotline (+44 (0) 15242 61166) provides a simple means of communication 24-7. Bulk foam stocks are held in constant readiness at foam production facilities and distribution centres in the UK, France, Italy, USA, South Africa, Dubai, Singapore and Australia.

When a call for help is received an emergency team springs into action. Depending on the scale and location of the incident, delivery by road can often be co-ordinated within an hour and by air freight within a few hours. Foam production staff at all sites are on constant standby to produce additional supplies of foam.

Angus Fire has supplied emergency foam stocks to several major storage tanks fire incidents, the first being at Milford Haven in 1983. More recently in 2003 the company chartered an Antonov 124, the largest heavy transport aircraft in the world, to air lift foam stocks to a multiple storage tank fire at Repsol-YPF in Spain. In the same year a Boeing 747 cargo aircraft was used to supply 100,000 litres of foam to a tank fire at Idemitsu Kosan in Japan.

IFF



كلية هندسة الإطفاء والسلامة ، سلطنة عُمان
The Fire Safety Engineering College, Sultanate of Oman



For further information, contact:

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Email: mhettini@fsecoman.com; info@fsecoman.com Website: www.fsecoman.com

Groupe Leader introduces the Vibraphone® ASB-8 and the Vibrascope® BVA-6

– two efficient equipments for search operations!



Basically, the Vibraphone®ASB-8, electronic listening equipment, is known to rescue teams throughout the world, and enables people buried under rubble as a result of catastrophes to be located. The exceptional sensitivity of the Vibraphone®ASB8 enables it to pick up the slightest sound made by disaster victims. It is also fitted with an adjustable filter which deadens the effect of dull noises like pneumatic drills, passing vehicles etc.

A team of three people is necessary for the use of Vibraphone®ASB-8: an operator, who listens thanks to a helmet, and the placing of two seismic microphones by his two team-mates. He co-ordinates positioning thus and listens to the sounds perceived by each of the two microphones. According to the perceived sounds, he indicates to his team-members the placement that is as near as possible to the victim, until locating him except for the meter.

The Vibrascope®BVA-6 enables disaster rubble to be searched and for victims to be contacted via a microphone incorporated in the camera. It comprises a telescopic pole at the end, which is an infrared camera, which

can rotate 360 degrees, together with a portable screen monitor. This equipment makes it possible to explore the debris and to speak to a possible victim via a microphone incorporated in the pole.

For example, at the time of an earthquake, a person is buried, he manages to emit sounds but nobody succeeds to locate it. The team equipped with a Vibrascope®BVA-6, works in binomial: The coordinator, who has the audio and video return of the pole, indicates to his team mate if he may advance or move back so as to position the pole until locating as best as possible the victim. Once located, it is then possible to communicate with him, to know if he is wounded, to reassure him until the rescues succeed in releasing him from the debris.



The range of uses for the Vibrascope®BVA6 vary from rescuing buried victims to surveillance and maintenance techniques for customs examinations, even archaeological investigations. . .

For more information, please contact:
Groupe Leader
Tel: +33.235.53.05.75
Fax: +33.235.53.16.32
Email: export@groupe-leader.fr

TFT Introduces New Line of Lightweight Hard Suction Hose

To compliment their rapidly expanding line of water flow and delivery equipment, TASK FORCE TIPS announces the introduction of a complete line of uniquely designed lightweight suction hose. Featuring TFT's own Storz and treaded couplings, this new hose offers improved UV resistance and greater flexibility, as well as incorporating TFT's new patent pending "no-leak"

coupling system. Available in sizes from 2½" up to 6", custom lengths are also available for rapid delivery. For additional information on these new products, and TFT's full line of water delivery equipment.

Visit www.tft.com, or contact customer service at 800-348-2686 for a complete catalog

Numerical Exercises in Fire Protection Engineering

By J. C. Jones, DSc, FICHEM, FRSC
 Department of Engineering, University of Aberdeen, UK

An effective tool for understanding fire protection engineering

This valuable book draws on the author's long and varied experience in combustion technology and contains soundly-based engineering calculations in fire protection engineering based on start-of-the-art methods. This branch



of engineering has evolved in order that knowledge in areas including chemistry, physics, structural engineering, mechanical engineering and statistics can be focused on fire safety. This is of especial importance in the operation of facilities such as airports, campuses and shopping malls and also in industrial settings where fire safety is vital due to the major benefits in terms of preservation of life and assets. The topics covered in the book have their basis in thermochemistry and heat transfer and examples covered are wide and include household fires, vehicular fires, extinguishments, calorimetry, evacuation of persons in a fire and detector systems.

The contents of the book have an original slant with many new ideas. However, these have been adapted into calculations which are ideal for student use, requiring no additional mathematical skills beyond those expected of an engineering or physics student. Each chapter has a short introduction followed by worked examples with information for the calculations being derived from international authoritative publications on fire protection engineering, resulting in a valuable teaching/learning tool.

Contents: Preface. Notation list. Dedication. Fire loads. Flashover. Post-flashover fires. Ignition of solid materials. Vehicular fires. Overpressures. Completeness of combustion. Cooling and extinguishments. Evacuation of persons in a fire. Detonations. Household fires. Detector systems. Appendix: Self-test questions. References.

This extremely useful book will be of particular use to undergraduate or post-graduate students in fire protection engineering including thermochemistry and heat transfer. It will also be valuable in professional training colleges and in-service courses.

ISBN 1-870325-48-6 234 x 156 mm 96pp
 softback c.£9.99 April, 2006

Greater Manchester Fire burns out roster issues with Smart Human Logistics

GREATER MANCHESTER FIRE AND RESCUE SERVICE, the second largest fire authority in the country, needed an advanced system to efficiently manage flexible rosters for its 1625 operational staff, improve productivity and accurately administrate employee data. Smart Human Logistics, the leading workforce management provider, has been chosen to standardise processes by consolidating time management, reducing overtime and introducing employee self service with their single integrated scheduling and attendance solution.

Steve Beckley, Assistant County Fire Officer at Greater Manchester Fire and Rescue, comments; "The Fire and Rescue Service is unique and complex but what is vital is that the fire-fighters we need are available at the times we need to save lives. The tailored technologies that Smart's system provides will help us to achieve this. We will significantly benefit from optimised workforce processes – from long term labour planning to workforce utilisation which will save us valuable time, ensure accuracy and allow us to plan the deployment of our fire fighters more effectively in the future."

With labour costing the Authority over £75 million a year, Greater Manchester Fire was in need of real time visibility and the ability to roster their staff according to demand. The authority provides 24/7 emergency support; but a key issue is that they experience peaks in demand at certain times of the day and night and in particular areas at certain times of the year. Smart's latest product version, eHL 2005 r1, will address this by giving the authority the capability to effectively deploy fire fighters as and when needed ensuring there is optimum cover at all times.

The system will also encourage workforce flexibility and staff empowerment by enabling them to manage their own rosters. This will be made possible through the unique self service functionality in the system which allows staff to view their rosters, request holidays and shift swaps with colleagues freeing up management time.

The system will go live in January 2006 and will be managing 1625 fire-fighters, across 35 locations. Along with the implementation of eHL 2005, Greater Manchester Fire will be introducing biometric hand readers across all the sites to increase security and accuracy within the authority. Significant cost savings, improved employee work life balance and increased productivity are just some of the benefits Greater Manchester Fire will reap from Smart's system.

Notes to Editors . . .

Founded in 1986, Smart Human Logistics is a world leader in the development of enterprise solutions for workforce management. Our unique eHuman Logistics offering integrates advanced time and attendance automation with workforce planning, scheduling and self service facilities.

With over 500 employers worldwide benefiting from Smart solutions and managed eHL services, the company has been instrumental in establishing the value of workforce management in today's competitive enterprise.



For further information or photos to support this release please contact:
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Email: gurpreetb@smarthumanlogistics.com



Spencer hits the slopes at Torino 2006

SPENCER, a leading manufacturer of emergency rescue equipment, hits the slopes at the Winter Olympics of Torino 2006.

After the 2004 Olympics in Athens, Spencer will be for the second time partner of the rescue services, in an event of international importance.

The medical equipment chosen to safeguard the participants and audience of the Olympic games held in Torino from 10th to 26th February 2006, will be Spencer.

Once again the unique features of Spencer products such as reliability, safety and innovation, have proven a substantial element in reaching a prestigious result.

Spencer products are used all around the world, because Spencer is an official supplier for UN organisations, such as UNRWA, UNMIK, FAO and WFP; moreover, Spencer frequently wins international Military and Civil Defence bids (in Poland, Turkey, Singapore and Jordan, to name a few); Spencer supplies Ministries of Health directly, in Lithuania, Hungary, the Philippines and airports such as Athens and Bologna.

It is only thanks to our constant commitment to total quality that we obtain success, winning fierce competitions in which high level international suppliers participate, due to the importance of the result and prestige involved.

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equipment that every day we manufacture for them. For this reason, we believe that it is fair for any professional user to be proud of the fact that the products they use on a daily basis, may be filmed by a camera and viewed worldwide whilst performing such an important duty.

Spencer has supplied to the organization of the Olympic Winter Games of Torino 2006 important quantities of rescue- and first aid equipment in order to guarantee the safety of both participants and spectators.

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Search Systems, Inc.

Victim location systems

Search Systems has been the leader in the development of technical search and rescue equipment since 1991. It was at that time that work was initiated on the first SEARCHCAM® Victim Location System using video, audio, and remote manipulation of the camera. Since that time Search Systems has become the International Standard for victim location equipment used in collapse and confined space rescue.

The SEARCHCAM 2000 and the DELSAR® Life Detector™ manufactured by Search Systems are basic components of most every major technical rescue team throughout the world. Since the establishment of the major systems indicated above, Search Systems has introduced other technical equipment designed for first-in operations, continuing operations, victim extrication, and hazmat communications, as well as products for the police, military, and security services.

Equipment manufactured by Search Systems is specifically designed using the latest technology to extend the eyes and ears of public safety personnel into voids and inaccessible areas while protecting the operators and also any potential victims. The ability to see and hear what is normally not accessible to search and rescue personnel allows them to use the valuable minutes immediately after an incident to locate victims, precisely identify their position and their physical condition, guide extrication procedures, and to generally expedite the mitigation of an incident.



The SEARCHCAM 2000 has evolved from a heavy and burdensome piece of equipment that was state of the art in 1993 into a lightweight, rugged and dependable audio/video search device. The camera head articulates 180° left to right and using established search protocol can rapidly scan an entire void area to either locate or rule out the presence of a victim. The variable gain audio is also used to identify victims who may be able to create audible indicators and to also assess the nature of their entrapment and injuries as well as maintaining voice contact. The SEARCHCAM 2000 equipment series offers a 2.3 meter Standard Probe, a 6.5 meter Super Probe, and a 92 meter Cable Probe all with the same audio, video, and articulation capabilities. The detachable monitor can be used either attached to the pistol grip style



control unit or it can be removed for a more convenient viewing angle or to allow other personnel to view. All SEARCHCAM equipment is compatible and the various components and accessories are interchangeable between systems. A variety of optional accessories are available including additional remote monitors, monitor extension cables, video output cables to support additional monitors or recording devices, and wireless transmitting monitors to transmit audio/video signals to a remote command center.

The DELSAR Life Detector is an acute listening device designed to detect seismic or airborne vibrations that may be created by a trapped victim. If the victim is able to create noise by tapping or pounding on concrete, steel, pipe, etc. or to yell for help the Life Detector is able to pick up the vibrations and to amplify them and translate them to meaningful video and audio signals that are monitored and interpreted by the operator. The unit consists of a series of up to six sensors that can be distributed up to 10 meters apart over the surface of a collapse area. Each sensor can be individually monitored to determine the presence of seismic or voice activity. When detected, the sensor that is closest to the activity will indicate a higher strength than the others. The sensors can then be redistributed around the location of the strongest one and the evaluation process can be repeated. This process continues until the equipment has triangulated to a specific location. At that point, other equipment such as the SEARCHCAM equipment and the Delsar Acoustic Sensor can be employed to more definitely locate the source. Some important features of the Life Detector are the ability to monitor all six sensors at the same time, the ability to monitor two audio channels at the same time (left ear/right ear), the ability to filter ambient noises such as heavy equipment and generators, and a five minute recording loop that records all activity including audio communications between the operators.

Please keep in mind that Search Systems put the **TECH** in **TECHNICAL RESCUE**. **IFF**



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The L&W 100 HP compressor: Portable, powerful, reliable

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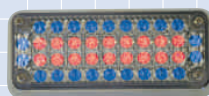
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Pic courtesy of Bullard



Thermal Imaging devices



**By Charlie McClung,
Ndip AEC Natal**

Thermal imaging technology has been around for a number of years now, used operationally in rescues primarily for the location of casualties disabled by toxic fumes and smoke resulting from fires. Based on heat source the imaging device can locate a casualty through thick smoke or fog enabling an otherwise prolonged blind search to come to a successful conclusion fairly rapidly. The benefits to both rescuer and casualty alike are enormous in terms of rapid extrication for the former and minimal hazard exposure to the latter.

This is one modus operandi for the thermal imaging device, but can they be used in other theatres of operations, for example Urban Search and Rescue operations during an earthquake, or structural collapsed.

FLIR or "forward looking infra red" has been used for some time now for location of criminals fleeing law enforcement agencies at night from helicopters using the same technology (heat source) these cameras are very hi-tech and expensive thus out of the average fire dept budget constraints.

The technology

Before we make up our minds we need to understand the technology behind thermal imaging and the limitations of the equipment involved.

All objects emit infra red radiation. Thermal imaging is the detection of the difference in intensity of infrared waves emitted from a heat source for

example either a body or fire. These are short wavelength emissions from the left of the colour spectrum and under normal circumstances largely undetectable by the human eye, as they are past the visible end of the light spectrum. They can however be detected by using technology such as cameras or other detection devices, which are capable of reading the infrared spectrum of light (heat) radiation and translated into images on the devices screen.

The light spectrum showing infrared location

The ability of being able to detect this end of the light spectrum is what makes thermal imaging cameras unique.



Pics courtesy of Bullard



Limitations are that infrared radiation does not pass through glass or water and buildings thus it is difficult to locate trapped persons under those circumstances unless the radiant heat has been in contact with the object (glass panel) to heat it up to create a heat signature.

Applications for thermal imaging

The use of thermal imaging in the Emergency field is quite widespread:

- 1 Law enforcement
- 2 Search and rescue (wilderness and water)
- 3 Fire fighting
- 4 Hazmat
- 5 Water rescue

As you know thermal Imaging cameras have proved very successful in fire fighting search and rescue, this is due to the fact that the cameras image infrared (heat) radiation which passes unhindered through smoke, this combined with the fact that everything emits infrared at different

rates (above absolute zero) means that an image is achieved in absolute darkness and in totally smoke filled areas.

The location of hotspots before during and after a fire can assist the fire fighters with valuable information as to where the fire started, where it is spreading and in the damp down process the possibility of flare up.

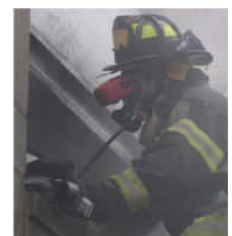
In the wilderness thermal imaging cameras are often used in the search for lost hikers and missing persons. Cameras mounted on helicopters are often used (FLIR) but hand held camera are often used where a small extremely densely bushed area needs to be searched.

Because chemicals give off different radiation signatures to water, hazmat teams can detect spills and indeed the level of fluid in containers using the cameras.

Law enforcement agencies use FLIR to detect and locate fleeing criminals and cars from their heat signatures. This has limited application if the suspect enters a building as the heat signature is then lost.



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Persons lost at sea can also be located or in a flooded river as long as part of their body remains above the surface, their heat signature can be detected.

Urban search and Rescue applications

In the USAR field (following an earthquake or structural collapse) the applications are a little different as often there is no fire and most of the surface casualties would have been removed prior to the arrival of the emergency services leaving only the lightly buried or entombed casualties behind.

Detecting heat signatures is often extremely difficult as in a collapsed structure situation, earthquake or single building collapse, there are often large crowds that have gathered to assist, machinery working on site and other sources of heat that may be read by the camera.

The solution is to clear the area, make sure that the rubble has time to “cool” thus removing all latent heat signatures. Then begin the formal scan with the camera. A simple test to explain this is to place your hand on a wall, leave it there for a minute or two then remove it. Scan the area where the hand was and you will be able to read the heat signature of the hand left on the wall. As the heat dissipates the signature will fade.

To the onsite commander Thermal imaging can be of great assistance in the USAR field.

In the size-up (SAVER® Phase 1)

Always perform your normal primary scene survey, secure the area removing all unwanted crowds and personnel. This will remove any latent heat signatures left by these people, allowing you to see the signatures that really count:

Potential hazards such as heat sources under the rubble of the collapsed structure (possible fire location, or chemical reaction) can be detected early on and either managed or avoided in the rescue effort, thus creating a safe working environment for the team.

In a situation where there is extremely poor

visibility (dense fog) or at night when lighting is not available reconnaissance using the camera will locate any surface or lightly trapped casualties, and thus assist the commander in his management of the incident.

Location and access of casualties (SAVER Phase 3)

Here the thermal imaging camera can be of assistance to the team.

Following structural collapse especially following earthquakes, the debris and casualties are covered in a layer of dust from the buildings’ cement walls. This often renders them invisible to the naked eye, and it takes a well trained team and/or search camera operator to locate them especially if they are unconscious and unable to call out or attract attention.

Casualties covered in a thin layer of dust or debris can be detected once their infrared emissions have raised the temperature of the dust/debris covering them to a point where they become visible to the camera without being visible to the naked eye.

However entombed casualties will not be detected from the exterior as their body heat emissions will not be sufficient to heat up the rubble enough to create a heat signature.

Often in a multi-storey pancake collapse rescuers gain access to the floors by making a hole in the floors and tunnelling vertically down. As a backup to the search camera the thermal camera can be used by rescuers descending through the floors into the rubble looking for heat signatures indicating a live casualty that may have been missed by the camera operator. This can also be invaluable if a casualty is found but signs of life are not determined yet.

Method of search

Firstly perform your normal scene survey, secure the area removing all unwanted crowds and personnel.



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Secondly, if safe to do so perform a physical search to locate any casualties that are lightly trapped and can communicate.

Then allow the rubble to “cool” to remove any latent heat signatures left by the search team, and perform a scan using the thermal imaging cameras. If appropriate the cameras can be used during the physical search as well.

Scan in a pre-designated pattern so as to avoid missing areas in the structure. During the physical search, areas with the potential for casualties can be identified such as voids and cellars searched as a priority.

At night, the lack of lighting will not hinder the scan as no light is necessary for the camera to see the casualty, however for team safety lighting should be set up as soon as possible. Remember halogen lights will register as a heat source if you look at them with a camera so try and keep scene lighting behind you when scanning for casualties.

The human body as long as it is still alive will produce some form of heat emission, and this will be able to be detected by the camera. Following death the body heat will be lost to the environment at a rate that varies according to ambient temperature. Profound hypothermia (Cold climate and prolonged exposure) could make the task of locating a casualty even more difficult so take this into consideration.

Saver Phase 7

Evaluation and training

Proficiency with any type of equipment stems from knowledge of the equipment itself (advantages



and limitations) as well as training and practice. These followed by experience at rescue incidents will enhance performance and confidence of the operator in the ability of themselves and the equipment.

Pros and cons

In every piece of emergency equipment there are pros and cons, and most equipment has multiple uses.

Advantages

In the case of thermal imaging cameras in the USAR field, their advantages encompass their ability to see where the naked eye cannot, offering the rescuer the ability to detect heat sources and therefore possible signs of life without endangering the lives of the search team. Because of their sensitivity as long as the heat signature is strong enough it will be detected very quickly. Surface casualties will be found rapidly with minimal delay.

Disadvantages

The cameras cannot penetrate into rubble or through glass or water. Thus only surface casualties or dust covered casualties (not visible to the naked eye) will be detected.

If there are a large number of heat sources detected, the operator will have to “triage” them and decide which is the most likely to be a casualty (training).

Conclusion

The question each rescue service has to ask itself is how does this piece of equipment fit into our operation, and will it enhance the quality of the service we offer to the community we serve?

Some equipment such as thermal imaging cameras are relatively expensive and beyond budget constraints. In saying that the rescue team must look at the applications for the equipment and what their particular service is going to use them for. Rescue units that are involved in Fire rescue as well as collapsed structure would have a very strong case to have cameras as standard equipment, because in a smoke filled room with visibility down to zero, it will save time and lives.

Rescue teams involved in just collapsed structure rescue, would probably regard the camera as a “nice to have” piece of equipment rather than a necessity, because they have K9 units, although if the budget allows it, I would definitely recommend it as it is often said in the EMS community following a call, “if only we had had X piece of equipment our task would have been that much easier” and we didn’t have it because we were afraid it would sit collecting dust waiting for that one call, and to justify purchasing the equipment and not using it for months would be really difficult.

But remember this, the cost of that piece of equipment is minuscule compared to the price of the life of the child saved during its single use.

IFF

*SAVER is the acronym for Systematic Approach to Vital Emergency Response. It is a seven step approach to emergency response. The SAVER-method has been implemented as an operational and training procedural guide in many countries. For more info see: www.icet.nl

Charlie McClung, Ndip AEC Natal

Charlie has been a rescue paramedic for 22 years, his skills were honed in the military and the KwaZulu Natal townships in South Africa as a National Diploma Paramedic before moving to Botswana where he was chief paramedic for an aviation rescue service. At present he runs a training school in Botswana and provides specialist rescue assistance the local emergency services. Part of his portfolio is a chief instructor for ICET in the Netherlands, providing specialist rescue training to rescue teams worldwide.

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The London bus garage fire, January 2006

Readers will be aware of the fire at the Westbourne Park, London bus garage on 22nd January. It might well go on record as one of the worst recent 'vehicular fires', at least in financial loss terms. Information at the time of preparing this note (less than 24 hours after the event) is sparse and our purpose is best served by reviewing vehicle fires broadly and then in a very tentative way relating that to Westbourne Park.

By J. C. Jones

University of Aberdeen

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When motor vehicles burn they do so with peak heat-release rates of 5 MW or higher. There have been direct measurements of heat-release rates from vehicles across a range of sizes at laboratories in the UK and in Sweden. (In one such measurement half a tram used: the apparatus would not accommodate a whole one!). About 20 to 25% of the mass of a saloon car, including the upholstery, paint and dashboard, is combustible. There is also of course the fuel, and the maximum heat-release rate and, perhaps more importantly, the time taken for it to be attained, depend on the quantity of fuel in the tank.

These sorts of heat-release rate are of course sufficient for flashover: a rule of thumb is that 1 MW is sufficient for flashover. However, if a burning vehicle is in the open air there is nothing to flash over to. In Saturday's accident there was, according to a Reuters despatch, destruction of ten buses and damage to two others. A later release of information by London Fire, the

authority which would have responded to the emergency, simply reports that twelve buses were 'damaged'. It is clear therefore that a fire having begun for an as yet unknown reason in one bus had affected many others, and it is of interest to try to judge whether flashover, or something akin to it, occurred. Whether the buses were under cover or not is not known to this writer, but the rapid involvement of so many buses suggests that their close proximity created the equivalent of an 'enclosure' for heat transfer purposes. If this is so, slow warming of the environment of the bus initially alight would have occurred and a stage reached where rates of heat release by the burning bus and of heat transfer from the entire group of affected buses to the surroundings were tangential to each other, whereupon a large and sudden rise in heat-release rate, identifiable with flashover, is expected. There is another possibility. The behaviour might have been simple propagation without the discontinuity which characterises flashover. If so the fact that hot gases released encountered obstacles in the form of the adjacent buses would have had the effect of raising the turbulence of the gases and hence the rapidity of the propagation. Either the 'flashover' idea or the 'rapid propagation due to turbulence' idea is consistent with the very limited information currently in the public domain. Whether either of them is correct will presumably become clearer as the formal enquiry takes its course.

There are reports of explosions during the fire, which almost certainly were due to fuel tank rupture and catastrophic fuel leakage leading to fireball behaviour. There was also much smoke, which can be attributed to the combustion of polymer materials in the buses and perhaps to the tyres.

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The fact that hot gases released encountered obstacles in the form of the adjacent buses would have had the effect of raising the turbulence of the gases and hence the rapidity of the propagation.

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What makes a good fire fighting pump?



by **Michael Mills**

CEng Engineered
Products Manager,
Angus Fire.

Self-contained portable fire fighting pumps are an essential tool for modern fire and rescue services, but changes to operational priorities have meant that the choice of pump is now based on more than just how much water it can move. Changes in engine technology in particular mean that the modern fire professional has a greater choice of pumps than ever before. When choosing a pump consideration now has to be given to the emission levels, weight, noise levels, ergonomic layout of controls and ease of service in addition to the basics of flow, pressure, reliability and of course price!

Portable pumps powered by internal combustion engines have been around since the early 1900s. However, it is only recently that larger air-cooled engines have come to the fore to provide the professional fire fighter with a greater choice of operational units.

The power unit

Diesel or petrol?

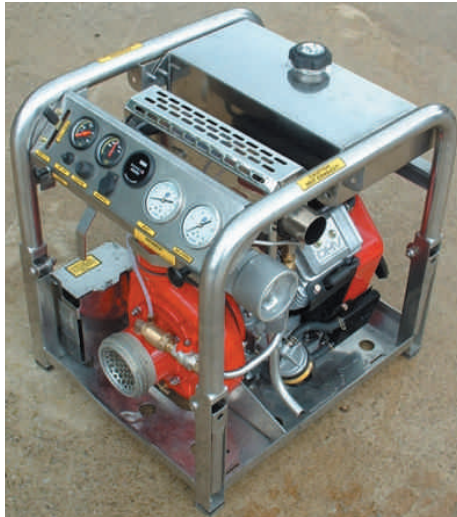
Petrol engines are generally lighter and cheaper than diesels and are preferred for portable fire pumps. However, some applications, typically refineries and chemical plants, where an electrical spark is unacceptable, require diesel engines. To comply with their requirements diesel fire pumps are also fitted with a spark arrester in the exhaust.

Because of the ability of a diesel to run economically for long periods industrial users are also looking to diesel pumps to meet their needs. However, while most manufacturers make diesel pumps from 12 hp up to 50 hp, petrol is still the preferred power source since a diesel pump can be 50% heavier than the equivalent petrol model.

Air or water-cooled?

Modern materials and construction methods mean that air-cooled engines to 35hp (26kW) and above, with forced air cooling via a ducted fan are reliable, even in ambient temperatures as high as 38°C (100°F). These new generation engines offer lighter weight and are more compact than water-cooled engines.

From 18hp (13.4 kW) upwards most portable



pumps use a 2 cylinder, V twin layout allowing air to be easily circulated around both cylinders. Over 40hp, 3 or 4 cylinders in-line is the traditional layout. There are two fundamental reasons for this. Firstly it is difficult to link more than 2 cylinders on to one crank pin without jeopardising reliability and bearing life. Secondly a 2 cylinder 40 hp engine requires individual cylinders of around 600 cc each and at this size economy and reliability suffer. However, once an engine has three or four cylinders in line air cooling becomes difficult as the inner cylinders cannot be cooled effectively and water cooling becomes necessary if the engine is to be run continuously at full power.

Multi-cylinder water-cooled engines offer reliability, power and good torque but the water cooling has to be achieved via a heat exchanger. Using the water from the supply being pumped can cause corrosion in the engine. More importantly, separating the engine cooling water from the pumped water allows the use of anti-freeze in the engine block – essential in most countries. The heat exchanger, the water and the water jacket around the engine all add weight and volume. In addition, water-cooled engines, unlike air-cooled engines, will overheat if the pumped water stops flowing and to protect against this some form of electronic over-heat cut-out is essential. When compared to an air-cooled unit it is clear that water cooling, while looking like an ideal solution, adds considerably to the weight, cost and complexity of the pump.

Emission Regulations

In Europe engines for non-road portable machinery are governed by European Directive 97/68/EC, modified by 2002/88/EC. In the USA two standards apply, namely CARB (California Air Resources Board) and EPA (Environmental Protection Agency). While other regulations may apply in other parts of the world, the regulations in most countries are based on one or more of these.

Most manufacturers of volume produced industrial air-cooled engines have a programme of having their engines approved by the US and European emission bodies. If a pump is intended for use in countries where emissions are a critical factor it is essential to check before choosing a pump that the power unit complies with local regulations.

However, power units derived from car engines do not always comply. While the unit may be compliant when fitted into the vehicle chassis the sensors and other electronic equipment that keeps the engine emission compliant is fitted to the car and does not move easily with the engine if it is engineered into a portable fire pump. For this reason smaller pumps fitted with volume produced air-cooled engines are more likely to be emission compliant than pumps with larger car derived engines.

Electrical or Manual Starting

The days of hot fire fighters desperately trying to pull start a portable pump with a flat battery and a poorly maintained engine are, luckily, in the past. Modern electrical starters and batteries ensure a first time start capability close to 100%. And in the unlikely event of battery failure it is possible to provide a manual start capability on smaller pumps up to 35 hp (26 kW). However, it is difficult to provide a manual start option for larger engines over 40 hp.

Most professionally built fire pumps incorporate electric start from an onboard battery with a manual pull hand start as back-up. However, some modern engines cannot be started manually if the battery is completely flat or missing. This can be critical in an emergency and consideration should be given to choosing a pump that can be manually started even if the battery is missing if this is an important operational requirement.

Electrical Systems

12V electrical systems are standard on most portable pumps and most engines are supplied with both a magneto (to provide reliable high tension electricity for the spark) and an alternator (to provide current for battery charging and powering accessories).

Better quality pumps are often provided with a standard socket that will accept an input for battery charging use while the pump is stored. The same socket can also then be used to provide a source of 12V DC electricity to power accessories such as a lighting mast when the pump is running.

Sound Levels

European regulation EN 12100-2 specifies two levels of control which relate directly to portable pumps. Above 85 dB, hearing protection must be available. Above 90 dB, hearing protection must be worn and warnings must be posted indicating the area where sound levels above 90 dB can be experienced.

It is important when operating pumps within the EEC that the measured sound level of a pump, when running at maximum capacity, is known so that the appropriate level of protection can be provided to operators. It is generally the more professional pump suppliers who are able to supply this information. Organisations who need to abide by these rules will need to consider the availability of sound level information from the manufacturer when choosing a pump.

Pump materials and construction

The pump body

Nearly all water pumps for fire protection and emergency services are centrifugal pumps. Only centrifugal pumps offer the combination of pressure, flow and efficiency required for fire fighting

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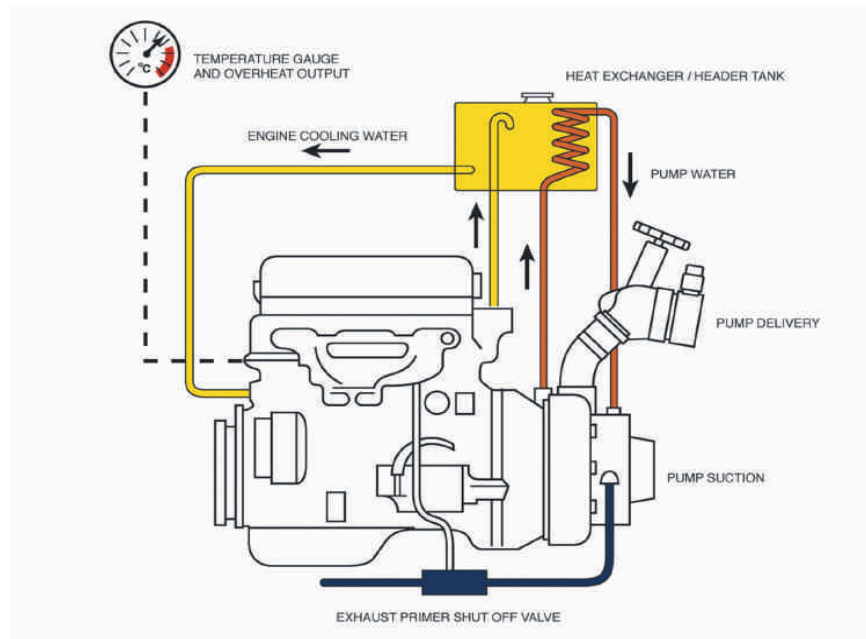
- Standard type devices to protect the breathing
- Devices to protect the neck and shoulders
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- Radio communication systems
- Refracting bands

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and flood relief operation and have the ability to handle dirty water when necessary. Generous clearances between the impeller and the body, and the water ways inside the impeller, are needed to allow dirt and stone particles to pass through the pump without damage. In addition, most pumps are fitted with an inlet filter sized to eliminate all particles that will not pass through the impeller.

To minimise weight most fire pumps are manufactured from high grade cast aluminium heat treated to improve its strength. Cheaper pumps, mainly used in the building trade, are often made from lower grade aluminium and care should be taken when choosing a pump for professional fire fighting applications to check the material specification.

Where corrosive liquids or seawater need to be pumped, the more professional manufacturers offer casings and impellers in Gunmetal or marine grade LG alloy bronze.

Pump Casing and ability to withstand high pressure

A modern pump intended for fire fighting is usually capable of generating 7 or 8 bar of output pressure at 3 metre suction lift. In this situation the pump casing becomes a pressure vessel and must withstand the full outlet pressure. However, in some applications fire pumps will need to take their water supply from a hydrant and will have to accept a positive input pressure. This can be as high as 5 bar. In this situation the pump casing must withstand the inlet pressure plus the added pump pressure, which can be as high as $5 + 8 = 13$ bar. To cope with this pumps designed for fire fighting professionals must have pump bodies that are pressure tested to at least 1.5 x the maximum working pressure the pump may see in order to be safe in operation.

Conversely, pumps only intended for building work are usually designed for the inlet to be at less than 1 bar (suction condition). These pumps will not withstand a large positive inlet pressure from a hydrant or relay pump.

Priming

Centrifugal pumps are not self-priming and all the air must be removed from the pump body and suction line before the pump will work. There are two main methods used for priming.

Positive priming. A small positive displacement pump (diaphragm, piston or vane) removes the air in the suction pipe until water reaches the pump inlet. Positive displacement pumps can be hand-operated or driven off the engine. Priming pumps driven off the engine, while powerful, require extra drive mechanisms and a clutch, all of which add weight, cost and complexity to the design.

Exhaust gas driven priming. Exhaust gas from the engine is diverted through a small jet or venturi. A vacuum is created around the outside of the jet is used to suck air out of the pump. In some pumps the suction venturi automatically cuts out when the water reaches the inlet, in others it is closed manually. On pumps with large engines there is enough gas to lift water from 7.3m (24 ft). However, smaller engines, with limited exhaust flow, may be limited to 4.5m (15 ft). Exhaust primers are generally simple to operate, and with no moving parts, are inexpensive and reliable. A good exhaust primer should be able to prime with water from a depth of 3m (12 ft) in around 20 seconds.

Pump standards

In the past most portable fire pumps in the UK conformed to the standard laid down by the UK fire and rescue service, JCDD 30. This called for 250 gallons/min at 100 psi (1140 l/min @ 7 bar), all at 10 ft (3m) suction lift. However, in recent years most fire and rescue services have moved away from this standard.

Most European countries have had their own standards but in common with the UK these have now been replaced by European standard EN 14466 which specifies a range of pump performance categories:

EN14466 Designation	Flow l/min	Pressure bar
FPN 6 – 500	500	6
FPN 10 – 1000	1000	10
FPN 10 – 1500	1500	10

Other performance ranges cover pressures of 15 and 40 bar.

Pumps in the USA are normally manufactured to meet the NFPA Standard 1921, which calls for a range of pump sizes and duties, specified at 5 ft (1.5m) suction lift.

NFPA Designation	Nominal Flow US gallons/min	Nominal Pressure psi
Transfer	200/300/500	15
Supply	100/250/500	50
Wildland	35/50/75	150
Combination	75/150/200	25
Combination	35/40/50	150
Attack	75/150/250	150

Pump selection

Portable fire pumps normally perform one or more of three different functions:

- Relay pumping
- Feeding one or more fire hoses from a hydrant or reservoir
- Pumping out flood water

Limitations in space and weight on fire appliances has led some fire services to replace large pumps with smaller models without compromising operational performance. The lower weight and compact size of modern air-cooled pumps make them ideal for meeting the demands of a modern fire service. Examples of the performance of three different sizes of pump offered by one leading manufacturer are given below.

Relay Pumping

200m horizontal pipe run	Flow at appliance	Pressure at appliance
1 x 30.6 kW (41hp) pump (feeding twin hoses in parallel*)	1,450 l/min	1.8 bar
1 x 16.3 kW (22hp) pump (feeding twin hoses in parallel*)	790 l/min	1.6 bar
1 x 13.4 kW (18hp) pump (single hose*)	420 l/min	1.6 bar

Fire hose operation from hydrant or reservoir

The number of hoses available from a single pump varies according to the inlet pressure. The chart below shows the number of hoses that can be fed from three sizes of pump at 2 bar from a local hydrant and at 3 m suction lift from a reservoir supplying an outlet pressure of 7 bar:

	@ 220 l/min per nozzle		@ 400 l/min per nozzle	
	2 bar positive feed	3 m suction lift	2 bar positive feed	3 m suction lift
30.6 kW (41hp) pump	7	6	4	3
16.3 kW (22hp) pump	5	4	3	2
13.4 kW (18 hp) pump	3	2	2	1

Salvage Applications

In salvage applications, such as pumping out a cellar, supply pressure is not critical. The predicted time taken for three different sizes of pump to clear a cellar 4m x 3m x 3m deep containing 36,000 litres of water is compared below:

	Time to pump dry
30.6 kW (41hp) pump	9 mins
16.3 kW (22hp) pump	12 mins
13.4 kW (18 hp) pump	17 mins

In the past UK fire brigades were tied to the old standard JCDD 30. However, pressure on space and weight on modern appliances has led many brigades to opt for smaller, lighter air cooled pumps since the performance is not significantly less than the old JCDD pumps when operational considerations are taken into account.

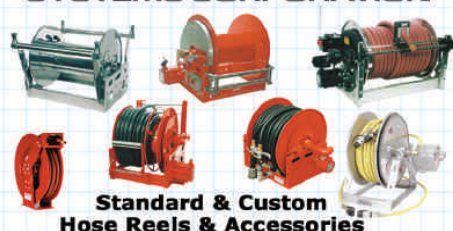
Pump build and layout

Frame

Portable fire pumps designed for professional fire fighting require a frame that is more robust than builders/trash pumps and manufactured from high quality materials such as stainless steel that are both strong and resist to corrosion. In addition, lifting handles are usually incorporated to make them easy to move over rough ground.

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Fuel Tank

A fuel tank with a run time capacity of at least 1 hour is important in an operational environment. Larger pumps sometimes incorporate the facility to re-fill the tank while the pump is running to avoid shutting off the supply of water while fire fighting. To achieve this the tank must be positioned so that any fuel spilled during re-filling cannot reach engine hot spots. To overcome this some larger pumps from professional manufacturers incorporate a fuel tank that swings away from the pump on hinges to allow safe filling without shutting down the engine.

Instrumentation & Controls

Professional fire pumps as opposed to builders pumps generally benefit from a high level of instrumentation which provides an important level of information and comfort to the operator. In addition to inlet and outlet pressures a well specified pump will show engine oil pressure, battery charging current, fuel tank level. It should also be fitted with an hours run meter to aid regular maintenance.

To meet modern regulations all controls should be easy to operate, well marked and not put the operator at risk by being adjacent to hot working areas such as the exhaust. One indication that a pump will comply with these requirements is if it is "CE" marked. This is an indication that the manu-

facturer has taken steps to ensure the unit is suitable for fire and rescue applications.

What makes a good pump for fire and rescue applications?

In the past fire pumps were traditionally heavy units with multi cylinder water-cooled engines. This was directly linked to the necessity to comply with the UK standard JCDD 30. However, requirements for a portable pump to take up minimal space, be reliable, have electric start and be capable of being easily lifted down from an appliance has led to a new generation of pumps being put into operation. In particular, lighter pumps meet the need for fire brigades to comply with the lifting limits dictated by the necessity to meet the diversity in size and strength of fire fighters in a modern day brigade.

Many fire and rescue services through out Europe are now favouring smaller, lighter air-cooled pumps. Experience has shown that the smaller capacity makes little difference in operational situations while the savings in space, weight and cost provide major benefits. To respond to this manufacturers of professional fire pumps are supplying compact air-cooled pumps that are robust, light, will withstand the pressures required, are easy to service, come with a high level of instrumentation and meet European emission and noise level legislation.

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FDIC Early Bird Discounts Ending Soon

FDIC, the only instructor/training fire event in the United States, gears up for the 2006 event in Indianapolis, IN, USA this April 24 – 29, 2006. Registration is open and classroom and Hands-on Training sessions are rapidly filling.

Attendees can save up to \$100 on show attendance by registering before the early bird deadline of March 13, 2006. Attendees registering early also have a better chance at first-selection of FDIC's most popular training and classroom sessions. FDIC is the largest fire training show in North America, boasting more than 25,000 attendees and 800 exhibitors.

Training that goes beyond FDIC

What sets FDIC apart from other North American fire shows is the focus on training and instructor development. All classrooms and Hands-on Training sessions focus not on the basics of first responder skills, but on the fundamentals of fire training. This focus allows attendees to learn new skills and technology while simultaneously learning how to take that training back to their respective departments to train others.

Where leaders come to train

FDIC kicks off with its signature program, H.O.T. (Hands-on Training) sessions. Attendees experience, in an interactive training environment, some

of the most intense training courses that focus on a range of topics from vehicle extrication to collapse rescue. Working through challenging situations in real-life settings, H.O.T. attendees experience first-hand the dangers they'll face in their jobs and learn the best way to prepare and safely work in such conditions. Led by leading industry experts in the United States, Hands-on Training sessions give participants advanced knowledge and skills that can easily be brought back to their firehouses to train other members of their departments.

From the H.O.T. training grounds, participants take their hands-on experience and apply it in a classroom setting. FDIC boasts a comprehensive conference featuring more than 120 powerful and pertinent classroom sessions that cover new developments in training, current events in the fire industry, management and legal issues. Taught by the fire training industry's top instructors, classroom sessions provide attendees the information they need to do their job well and safely.

"FDIC addresses the concerns and training needs of first responders worldwide – with

Some of the FDIC sessions that fill up early include:

H.O.T. Evolutions & Workshops

- Conducting NFPA 1403-Compliant Fire Attack
- Flashover Simulator
- Fixed Burn Building Instructor Training
- Fireground Academy
- Fireground Tactics

Classrooms

- Realistic and Relevant Training to Fit Your Budget
- The Point of No Return: How Firefighters Die and the Rule of Air Management
- Initial Size-Up Reports for the First-Due Company Office
- Building a Technical Rescue Team from the Ground Up
- Truck Operations in Wood-Frame Structures

Who should attend:

- Fire Chiefs
- Administrative Chiefs
- Line fire Chiefs
- Training officers
- Company officers
- Fire instructors
- Career & volunteer firefighters
- EMTs & paramedics
- Apparatus & equipment specialists
- Technical rescue specialists
- Haz-Mat technicians
- Fire academy & fire science students

seminars that traditionally cover such topics of general interest as response to terrorism, protecting industrial facilities, search and rescue, structural collapse rescue, low-cost training, becoming a better instructor, lessons learned from major incidents, response to natural disasters, rescuing our own, and hazardous materials, to name a few," said FDIC Conference Director Diane Feldman.

FDIC's state-of-the-art exhibit hall allows people to see, up-close and personal, the latest technology, products and services designed for the fire and EMS industries. With more than 800 exhibitors consisting of top-notch manufacturers and suppliers, FDIC attendees can see what is new



in the industry and how those products can help their departments. In addition, exhibitors and attendees also have many opportunities to network during exhibit hall hours and special events.

The legacy of FDIC

While training and education are the foundation of FDIC, another well-known aspect of the event is the tradition of brotherhood that attendees experience. "Stand alongside fellow firefighters from all over the world who are brought together at FDIC by a common bond—their desire to save lives, protect property, and go home safely at the end of the work shift," said Feldman.

Sponsors include E-One, Globe Manufacturing, Kidde Fire Fighting, Rosenbauer, American LaFrance, MSA, Class 1/Hale, Super Vac, Drager Safety, tyco/Scott, Rosenbauer, Spartan, Holmatro, Bright Star, DuPont, Pierce, HAIX, Paul Conway Shields, Federal Signal, Fire.com, Darley, Ferrara, Hurst, Will Burt Company, Allison Transmission and Whelen. FDIC is hosted by the Indianapolis Fire Department and co-sponsored by the FAMA, FDSOA, FEMSA and Indianapolis Fire Fighters IAFF Local 416.

Attendees may updated event information and register online at www.FDIC.com. Early bird discounts rates are available through March 13, 2006. For questions regarding the event, please call +1-888-299-8016. **IAFF**





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What Is Your Plan For Ongoing Continuous Improvement?

If Class A foam is not now in your SOP's, here is a strong case to move it to the top of your list

Would You Believe Me If I Told You...

Recently I was with a team that within a week reduced lead time from days to hours, reduced inventory by 90%, defects and errors were down 50%, productivity was up 50%, floor space requirements were reduced by 25% and customer service improved to 99%.

Businesses around the world are experiencing similar improvements. The process, built on the Toyota Production Model, is called a Kaizen Event. The term means *ongoing continuous improvement*. Part of the process of achieving such startling improvements is removing the limits from the current way we look at and do things.

Ongoing Continuous Improvement

Could we achieve a similar magnitude of improvement in the fire service? Absolutely! For starters let's look at how we reduce our fire losses. Several years ago, the Los Angeles Fire Department conducted a series of burns to compare the performance of water, Class A foam and Compressed Air Foam. They are often referred to as the Palmdale Tests.

Chart 1 summarizes the time to knockdown for the three extinguishing mediums. The water attack required 50 seconds to achieve knockdown. The Class A attack required only half that amount of time, providing a **50% improvement**. The CAFS attack took just 11 seconds. That is a **78%**

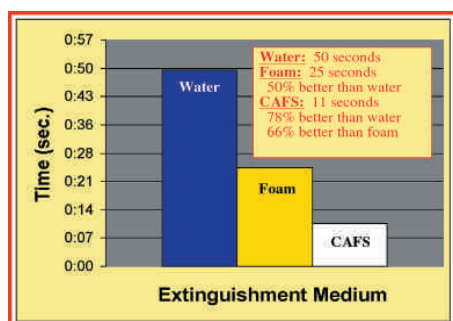


Chart 1: Time To Knockdown

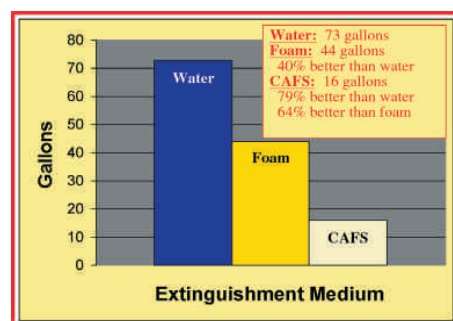


Chart 2: Gallons Required To Achieve Knockdown

improvement over the water attack.

In Chart 2 we see the total gallons required to achieve knockdown with the three extinguishing mediums. Here we see a similar pattern. Class A foam provided a **40% improvement** over plain water while CAFS showed a **79% improvement**.

Class A fuels account for over 97% of the fires encountered in the United States. Based on the Palmdale data, you could make the argument that when encountering these fires, from the time water starts flowing to knockdown, **losses could be reduced by 40% with Class A foam and by 78% with CAFS.**

Additional Benefits

So far we have only mentioned the loss reduction resulting from the use of Class A foam and CAFS. Perhaps the greatest benefit, no doubt more difficult to measure, is the improvement in firefighter safety. Firefighters are exposed to the situation for significantly less time while at a safer distance. This results in far less stress, with fewer burns and injuries to firefighters.

Overhaul and clean-up operations are substantially reduced. Foam penetrates and wets fuel much better than plain water. This means fewer rekindles, reducing the need for engine companies

to return to the scene. Because the fire, water and smoke damaged is reduced, more evidence is preserved for arson investigation, greatly improving chances of a conviction.

ISO Credit For Class A Foam

If the reasons we have discussed are not compelling enough for you to implement foam on your department, ISO now gives you further incentive.

For those outside of Texas, ISO will give equivalency credit for a built-in proportioning system or CAF System. For your Foam Supply they will give credit for up to 25 gallons of Class A foam. (They do not recognize wetting agents, emulsifiers or surfactants.) **So size your foam tank to be at least 25 gallons.** For full details you can visit the ISO website at www.isomitigation.com

In Texas, ISO credit is now given for Compressed Air Foam Systems when used in the extinguishment of all structure fires. The standard states:

- The engine must be a NFPA 1901 Class A pumper
- Minimum 500 gpm pump
- Minimum 120 scfm air compressor, permanently mounted

Foam penetrates and wets fuel much better than plain water.

This means fewer rekindles, reducing the need for engine companies to return to the scene. Because the fire, water and smoke damaged is reduced, more evidence is preserved for arson investigation, greatly improving chances of a conviction.

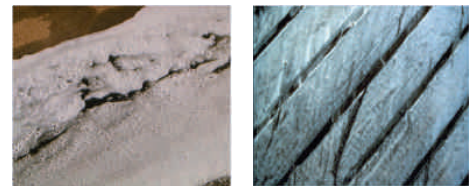
- Minimum 2.5 gpm Class A foam concentrate pump
 - Minimum 20 gallon foam tank for Class A foam
 - At least one engine equipped with a CAFS unit must respond on all structure fires on first alarm assignment
- You can visit their website at www.tdi.state.us/general/pdf/fmtxaddendum.pdf

Getting Started

Assuming you are now convinced, or convicted, to implement Class A foam or CAFS, I will offer a few quick suggestions aimed to help you get started.

First, there are now new NFPA 1901 Standards in effect. Get a copy and familiarize yourself with the standards that apply to foam proportioners and CAFS. Remember, these are intended to be minimum standards. If you follow these standards when writing your specifications, they will help ensure you get a system that will work properly and meet your needs.

Operationally with Class A foam, you will want to be able to vary the quality of the foam solution from wet, to fluid, to dry. Wet foam, (0.2%), with small bubbles, will penetrate fuel and is ideal for overhaul operations.



Photos 1 and 2: Wet foam at 0.2%

Fluid foam, (0.5%), will give a medium bubble size, ideal for initial attack.



Photos 3 and 4: Fluid foam at 0.5%

S.O.P.



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	Aerial monitor	2400 L/min	14.0 bar
Normal simultaneous performance	Hand lines and/or ground monitor	3000 L/min	10.0 bar
	HP hose reel	200 L/min	42.5 bar*

Based on operating at 3.0m suction lift through 5.5" nominal suction hose fitted with suction strainer.

*Pressures and flows may be reduced by using an additional HP relief valve.

The Godiva World Series pump with triple pressure range capacity provides three different levels of pressure discharge.

The pump will simultaneously supply -

1. Low pressure outlet through hand lines
2. High pressure hose reel
3. Aerial monitor

A modification of the field-proven World Series WT pump, it combines the low and high pressure impellers with an innovative discharge manifold to provide three different outlet pressures (patent applied for).

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Photos 5 and 6: Dry foam at 1.0%

You will want a proportioning system that will provide sufficient accuracy to enable you to obtain the foam quality you need for the given situation over the range of flows and pressures where you will operate. If the proportioner you are looking at cannot produce the foam properties illustrated in the photos, you should keep looking for one that can. Which leads us to another important point.

My Foam Doesn't Look Like That

I have encountered many situations where a fire department could not get the solution to look like the wet, fluid and dry foam we just discussed. What it usually goes back to is someone got a "really good deal" on foam concentrate. Without exception, around the world, I have always found that the price of the concentrate is proportional to the level of active ingredients in the product. You get what you pay for. Buy only quality foam. Even the good quality Class A foams are not that expensive. The flow and percentage rates they are

I have always found that the price of the concentrate is proportional to the level of active ingredients in the product.

used at are much lower than with the Class B concentrates. Besides, you don't pay for the concentrate, you make the insurance company pay for it.

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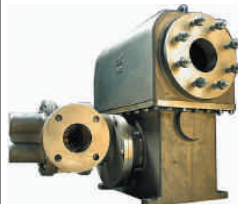
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Pic courtesy of Draeger



Telemetry improves firefighter safety on a global basis

By Gerd Pearson

Portfolio Manager for
Compressed Air
Breathing Apparatus
and Merlin Telemetry at
Draeger Safety

Recent events such as 9/11 have caused firefighters around the world to take stock of their operational procedures. The reliance on manual systems, for example, has certainly come under the microscope and fire and rescue departments throughout North America and Europe in particular are turning to a more secure system of accountability.

Although originally developed to meet the needs of the UK firefighting market, entry control procedures are forming part of this revolution and are enabling, with the use of one simple, reliable system, firefighting accountability to be both accurate and easy to implement.

Acting as a framework under which procedures can be solidified, the use of telemetry can combine the communication of vital information with a straightforward system of accountability. For example, if a tally key is in the entry control board, the controlling officer can be sure that the firefighter is taking part in the incident and is in the building or hot zone. Not only that, but telemetry can provide real time information about the status of that firefighter such as cylinder pressure, time to whistle and the thermal absorb temperatures of the firefighter.

So how has this come about and why is it so vital?

Derived from TB1997 which lays down very stringent and specific methods for the monitoring of breathing apparatus (BA) wearers by stage 1 entry control officers in the UK, modern telemetry systems are bringing firefighter safety to another level.

Paul House, Regional Focus Group Manager, for Draeger Fire Service market in the USA comments, "At the end of the day, fire chiefs want to be able to send their firefighters home to their families, and any procedures that achieve that goal are very well received. Without a doubt, 9/11 and other recent disasters have shown us the need for more clearly defined systems where firefighters, particularly those who have entered a building, can be accurately accounted for. North America was certainly heading in the direction of telemetry but the sad events of 9/11, have accelerated the time-frame within the departments."

Fire departments have found, from bitter experience, that there is no way that, even with the

Pic courtesy of Draeger



best will in the world, huge numbers of firefighters can be monitored with a manual system. Instead, technology led telemetry systems are now being used to ensure that the all-important gap between entering and leaving an incident is fully controlled.

Telemetry not only accounts for the firefighter, but it is also used to monitor vital information and communicate emergency signals. What's more, all of this functionality can be easily integrated into the fire service department with the addition of just one system and without too much interruption to standard operating procedures.

House explains, "The Draeger PSS Merlin system, for instance, provides better management control and is, we believe, a true management system. In talking to North American brigades, we have learned that the real success of the system lies in its simplicity, immediacy and reliability. For the first time, battalion chiefs or entry control officers outside the incident have more information at their fingertips than ever before. This means that they are in a better position to make decisions that ultimately affect the lives of the firefighters and the success of the operation."

In the past, and where manual procedures have been used, information such as the number of firefighters entering, their time of entry and, therefore, the time by which they should have left the scene, has been very much reliant upon guesswork. Obviously, the heat and work rate inside the building will have an effect on the way in which a firefighter is breathing and the breathing rate will, in turn, vary the amount of breathing air remaining. Entry control officers have only been able to estimate the time of exit and raise an alarm once that time had expired and they had not exited. Similarly, if a firefighter had stopped moving, the entry control officer would have been unaware of that fact until the due time of exit has passed.

All that is now changing on a global basis

Firefighter friendly and simple to use, the PSS Merlin telemetry system is believed to be the first entry control system of its kind. Unlike other systems that are computer controlled and at the risk of sys-

tem crashes or hard drive problems, for instance, the PSS Merlin is not computer driven and does not need booting up. This means that it is ready for any rapid response situation and is ready for use in moments.

Fast and accurate, the Merlin incorporates an entry control board, an electronic monitoring system such as the DraegerMan Bodyguard II or Sentinel II and a portable radio unit attached to the firefighter's BA set.

Using radio technology to continuously transmit and receive data from up to 12 individual firefighters simultaneously, per board, this self-contained, state-of-the-art electronic system is able to remotely monitor their exact status and safety from outside the incident. As a result, and unlike traditional manual or semi-manual systems, the PSS Merlin provides Entry Control Officers with a continuously updated supply of vital information, thereby enabling them to react immediately in an emergency.

The transponder based control board, which is based on the standard UK control board, incorporates additional electronic displays. Fully automatic and able to support rapid deployment procedures, it provides one continuous display channel for each firefighter simultaneously, with full manual back up if required.

Incorporating Tally Control operation, a system whereby each firefighter has an individually named or numbered function card, it also combines pressure indicators, temperature monitoring and distress signalling in one unit. Most importantly, this provides the wearer, as well as the entry control officer via the PSS Merlin, with an accurate calculation of remaining air time which is updated every second and is based on current air consumption.

Firefighters log on individually by removing the tally key from the electronic monitoring unit (Bodyguard or Sentinel) and inserting it into the control board. They are then allocated a specific channel and two-way communication is established immediately. Each channel displays an on-line signal, ADSU alarm signal and evacuation and withdrawal signals. These signals can be given, received and acknowledged by both the BA wear-

er and Entry Control Officer.

The control officer can select whether to view time to whistle, time of whistle, cylinder pressure or temperature, and additional data can be displayed according to requirements. Group and individual evacuation commands are also supported by a separate voluntary withdrawal facility and, in the event of a radio signal being lost, audible and visual warnings will alert both the BA wearer and the Entry Control Officer.

The big plus point as far as brigades are concerned is the fact that this system can be so easily integrated into existing operating procedures. Straightforward and simple in use, it brings more confidence to firefighters as well as those in charge of entry control and, for this reason, is being welcomed by both UK and non-UK departments.

The scene is changing in other areas of Europe as well. The Frankfurt Fire Brigade, for instance, took the first step towards better observation of its firefighters with the acquisition of 522 Draeger PSS90 compressed air breathing apparatus systems, complete with Bodyguard II electronic monitoring units in 2003.

Easy to use and with simple push-button controls, Bodyguard II/Sentinel II was chosen because it offered a host of previously separate warning and monitoring devices within a single instrument. For example, this advanced data storage unit not only indicates how much air is left within the cylinder but, by calculating the current rate of consumption, will advise the firefighter how much time he or she has left. In addition, it can provide a temperature reading and act as a distress alarm if a firefighter becomes trapped. If a firefighter is unconscious and cannot move it will, after a pre-determined time, sound an automatic alarm which is both visible and audible. Time to whistle is refreshed every second and the digital pressure reading in bar is shown together with a simulated analogue gauge and temperature indication. All of this information can be read at the entry control point via the Merlin control board.

The next logical step was, therefore, to further enhance the CABA systems with the addition of PSS Merlin Telemetry.

Carmen Werner, an Officer with the Frankfurt Fire Brigade, is responsible for breathing apparatus, open and closed circuit systems, and is very much of the opinion that telemetry is here to stay. She comments, "We had used a manual system in the past which involved lots of radio dialogue and manual checks. With the Merlin system, our communication lines are now kept open for emergency and other essential information only. We no



Pic courtesy of Draeger

longer have to ask, over the radio, how long a firefighter has until time to whistle, or to issue clocks to ensure that we speak to them every 20 minutes. If a member of the BA team stops moving, the system automatically sends an alarm to the entry control officer and we can react appropriately. By being aware of all their vital data from outside the incident, we can offer much better security to our firefighters and this is something that both we and they value immensely."

She adds "Another huge advantage of the Merlin system is that we have been able to add it straight on to our existing units. We have not had to change our operating procedures beyond maintenance and servicing and have certainly not had to build new systems of work. The transition has been very easy and, once we have made some final minor adjustments, we will be rolling the systems out to our other seven divisions.

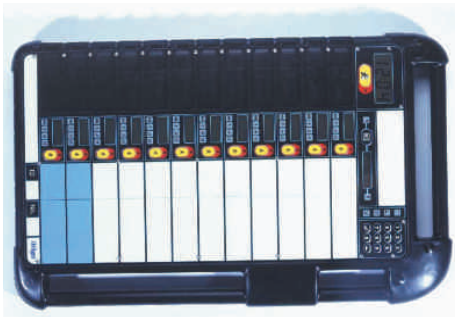
"In addition", she concluded, "we will also be exchanging our existing Draeger BG4 closed circuit systems, for new BG4's complete with Bodyguard II/Sentinel II. This will mean that telemetry can then be used with other applications where extended breathing air is required."

Gerd Pearson, Portfolio Manager for Compressed Air Breathing Apparatus and Merlin Telemetry at Draeger Safety comments, "This reaction to the way in which the system can be easily incorporated is typical of many fire brigades. When we set out to design the system we knew that it had to be ready for use in seconds and offer more features and immediacy than just a computer controlled version of a manual system."

He concludes, "We brought in as much functionality as we could as well as data recording capabilities to meet the administrative requirements and, at the same time, revolutionised the ability to obtain essential data from firefighters from outside the incident. It leaves firefighters free to do the job they are there to do rather than spend their time communicating, sometimes unnecessarily, with the outside world. That adds up to more safety and security for everyone involved."

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Further information is available from:
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Pic courtesy of Draeger

A hydrogen peroxide explosion in Tokyo, 1999

Readers of the earlier article [1] on the hydrogen peroxide explosion on the M25 might be interested to know of an accident in Tokyo involving hydrogen peroxide some six years ago. The present author was himself unaware of this until an account of it appeared in proof form in 'Journal of Hazardous Materials' [2]. Reference [2] describes a detailed follow-up involving some laboratory testing, which explains the six-year gap between the incident itself and a peer-reviewed article appertaining to it.

By J. C. Jones

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In the Tokyo accident waste hydrogen peroxide was being carried in a tanker on the Metropolitan Expressway. There were no fatal injuries, but 23 non-fatal ones from burns and flying debris from the tanker. Although the word 'waste' is used in the article under discussion, as far as the present author can deduce this does not mean 'spent' or 'reacted': the industrial facility using the peroxide had closed down so unused hydrogen peroxide was being taken away for disposal. The design of the tanker was such that it had two separate compartments, and immediately before the payload of hydrogen peroxide was admitted one compartment had carried an aqueous solution of iron III chloride, FeCl_3 and the other an aqueous solution of copper II chloride, CuCl_2 . There was no

cleaning of the tank before admittance of the peroxide. However, the driver tested hydrogen peroxide with FeCl_3 and with CuCl_2 separately, *in situ* at the respective tank compartments. A vigorous reaction was observed with the former and no reaction with the latter. Hydrogen peroxide was therefore admitted only to the compartment which had contained CuCl_2 . The quantity of hydrogen peroxide so admitted was 500 litre. The explosion occurred two hours later.

The view taken by the investigators was that hydrogen peroxide decomposition in the presence of CuCl_2 displays an induction time which was exceeded in the two hours from peroxide admittance to the accident and laboratory work, details of which an interested reader of this piece will find in 1, was directed at this point. The (not very surprising conclusion) was that destabilisation of the peroxide by the copper compound was the reason for the explosion. The article concludes with a heavy criticism of the reliance there had been on a crude chemical test initially. In fact, it is very surprising that the loading of the tanker with hydrogen peroxide was even allowed on the basis of such a test.

IFF


References

1. Jones, J. C., 'Commentary on the M25 lorry explosion' International Fire Fighter November 2005 p. 12.
2. Kumasaki, M., 'An explosion of a tank car carrying waste hydrogen peroxide' Journal of Hazardous Materials – in press. Corrected proof available on-line via Science Direct.

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investigators was that
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decomposition in the presence
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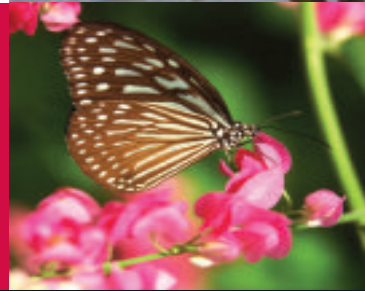
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Fire fighters apply foam at Buncefield fire. Pic courtesy of Captured Images



The Buncefield Oil Depot Explosion



By Dr J. C. Jones

Buncefield, where a serious accident occurred early on Sunday 11th December 2005, is a major facility for storage and distribution of hydrocarbons, having been in use as such for over 35 years. It receives refined products from places including Canvey Island in the Thames estuary, one of the most important centres in the UK chemical industry. Gasoline and fuel oil from Canvey Island are transferred by pipeline to Buncefield. Another source from which the Buncefield terminal receives fuel for distribution is the refinery in Lindsey, Lincolnshire, which is owned by Fina.

Buncefield is in the business of distribution and hydrocarbons which pass through the facility are already refined and ready for their intended uses. As well as gasoline and heating oil, jet fuel is received at Buncefield for transfer by pipeline to the airports of London. The total capacity of the Buncefield storage facility is about 2×10^5 tonne. This comprises petroleum distillate of various boiling ranges all of which have a calorific value of around 45 MJ kg⁻¹. There were 43 injuries due to the recent accident at Buncefield, none of them fatal.

A release on the Internet by the Health and Safety Executive dated 15th December 2005 identifies organisations which, in addition to

themselves, will be involved in the follow-up. They include the Environmental Agency and Total UK Ltd. Readers will by now be aware of the facts of the accident and in an article at this stage our purpose is best served simply by reviewing some of these facts as reported in the media and also by critically evaluating some of the comments which have been made.

The 'biggest fire in peacetime Europe'.

The quantity of fuel burnt at Buncefield is in most reports is equated to the capacity of the facility, about 200000 tonne as already stated, although at any one time the facility was not necessarily filled to capacity. The statement repeated many

Pic courtesy of MSI Images



times that the fire was the largest in peacetime Europe is made on this basis, the quantity of fuel burnt. There have however been statements¹ that the Buncefield accident was the largest *explosion* in peacetime Europe and this is unlikely to be so. The magnitude of an explosion has to be expressed not in terms of quantity of fuel but of

overpressure. It is possible for any amount of hydrocarbon to burn without there being an overpressure at all, in which case the word 'explosion' is not even applicable. There were indeed explosions at Buncefield, but most of the fuel which burnt did so under conditions such that there was no overpressure. When the fire was at such a stage there was immense danger from heat but none from explosion blast, and the challenge to the emergency services was to restrict propagation until such time as the total heat-release rate was low enough for the aqueous film-forming foams which had been brought to the scene to take effect.

The most suitable parameter for comparison of Buncefield with other hydrocarbon *explosions* is the 'TNT equivalence': the amount of TNT in tonnes which would have caused the same degree of damage that the fuel which burnt at Buncefield did². The TNT index at Buncefield will not be known until resulting damage to buildings and structures at measured distances from the site has been closely examined, and this will be part of the forensic procedures which are as yet in the future. It is probable that when formal documents on the explosion start to be issued estimates of the TNT equivalence will be expressed. Moreover, it is sometimes possible to assign only a very broad range to the TNT equivalence of a particular explosion. For example, when in Decatur Illinois in the 1970s there was a severe hydrocarbon explosion it was only possible to conclude that the TNT equivalence was between 20 and 125 tonne, a range which spans over half an order of

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magnitude. If because of destruction of evidence by the fire the TNT equivalence at Buncefield can only be expressed with equivalent precision to that at Decatur the 'worst explosion in peacetime Europe' view might remain permanently unverifiable.

Preliminary application of risk analysis

It is sometimes helpful to step back from the consequences of an accident to the design features of the facility where the accident occurred. The Buncefield depot had been in use for several decades as already noted, but that does not of course mean that its design and safety features have been static. Safety procedures will have been modified in response to changes at the terminal itself and in the 'built environment' close to it. The age of the facility is therefore unimportant as its safety standards would have been those of 2005. In support of this point we might note that there has not been a refinery built in the US for 30 years, but at each and every refinery there safety measures applicable are those of the present time. When a facility such as a refinery or a storage depot is in service for tens of years its safety procedures evolve in response to improved practices and the incorporation of these into industry standards and legislation. There have been references to the fact that there was a review of the fire safety measures at Buncefield by the Health and Safety Executive (HSE) only weeks before the incident with the possible implication that the review must have been inadequate³. This of course is quite unscientific. Wherever hydrocarbons are stored, transported or processed there is a risk of leakage followed by ignition. This is where the discipline of risk analysis becomes applicable. In the box on the next page a relevant analysis is presented. *The facts and figures are of the writer's own devising and in no way relate to Buncefield.* Nevertheless, calculations of the type below feature in the assessment of fire safety at places like Buncefield.

The bottom line in the calculation is the frequency with which leakage, failure of emergency responses (see footnote 4) and ignition will occur. This frequency will have been negotiated in advance and approved as being acceptably low. It can never be reduced to zero.

This has been a simple example of risk assessment for pedagogic purposes only. Returning from such hypothetical calculations to the Buncefield accident, it is likely that the inspection which took place a few weeks before the fire would have ensured that conditions and operations were such that the frequencies previously deemed acceptable were still the actual frequencies. To that end the inspectors would, for example, have satisfied themselves that the condition of the tank was such that the value of 'n' as defined in the boxed calculation need not be revised. It would not and could not have ensured that 'n' had value infinity, signifying that leakage from the tank could not possibly occur. Those who point a finger at the inspection are saying in effect that this should have been the case. The writer is able to make engineering judgements only on such information as is in the public domain and is not attempting to vindicate any party. He is simply pointing out that the fact that there was an inspection of the fire safety measures not long before the accident is not in itself evidence of any inadequacy.



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Consider a vessel containing gasoline. There will be in addition to the tank itself fittings including influx and efflux pipe work. Let the frequency of sustained leakage from the vessel be 10^{-n} per year.

If for example $n = 2$ the frequency is 10^{-2} per year, once every hundred years.

Let there be an emergency response such as a device which will divert the gasoline in the leaking vessel to a standby vessel⁴, with fractional reliability ϕ .

ϕ can vary only in the range zero (sure to fail!) to unity (sure to work). In practice a figure of around 0.98 is likely to apply.

The probability that the device will fail to operate as required is therefore:
($1 - \phi$)

Gasoline leaked will not necessarily ignite. It requires to do so rapid supply of energy of the order of millijoules. The probability of ignition depends on the flash point, the leakage rate and the ambient temperature.
Let this probability be P .

$P = 1$, ignition certain. $P = 0$, ignition impossible. For a low-flash-point material such as gasoline a value of P of about 0.9 is suitable.

Frequency of a course of events whereby:

Gasoline leaks from the vessel

The emergency diversion operation fails

The leaked gasoline ignites

is therefore:

$$10^{-n} \times (1 - \phi) \times P$$

Inserting the arbitrary numbers in the shaded areas gives:

$$\text{Frequency} = 10^{-2} \times (1 - 0.95) \times 0.9 \text{ per year} = 4.5 \times 10^{-4} \text{ per year, once every 2222 years}$$

Concluding remarks

It is expected that further articles, or perhaps a series of short commentaries, on Buncefield will follow during what will obviously be a very lengthy follow-up. Buncefield is one of two chemical accidents in the UK during the second half of 2005 which will find a long-term place in the literature of the subject. The other is the hydrogen peroxide accident on the M25 on 30th August which has also been the subject of an article in this periodical.

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1 See for example the statement issued by the British Geological Survey on: http://www.earthquakes.bgs.ac.uk/latest/hemel_hempstead_11122005.htm
See also:

<http://www.journalofmaps.com/cgi-bin/blosxom.cgi/2005/12/15>

2 Since the drafting of this paragraph and final submission of the article a site has appeared on the Web in which estimates of the TNT equivalence are invited, the author of the site 'reckoning' about 100 tonne but acknowledging a lack of expertise. The view of the present writer is that the only value of this site has been to introduce the matter of TNT equivalence into the debate.
3 See for example:

<http://www.buncefield.com/cgi-bin/yabb2/YaBB.pl?num=1135254797/0>

and:

http://www.itn.co.uk/news/britain_1018919.html

4 It is not known to the writer whether or not such a device was in use at the tank in which the initial explosion occurred at Buncefield.

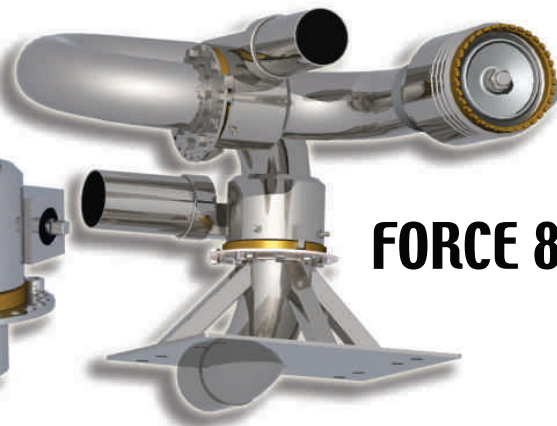
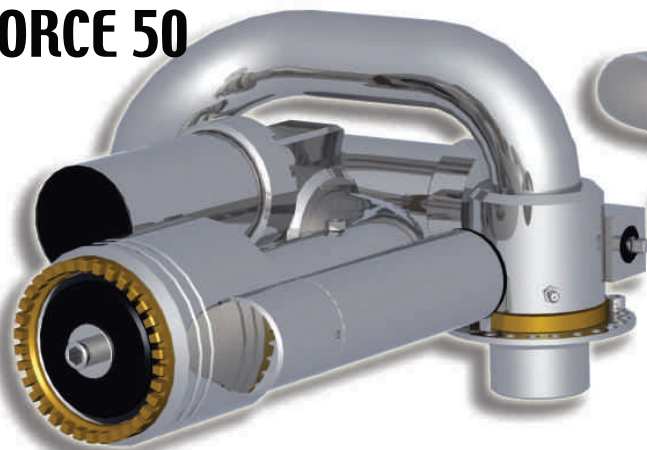
Dr Clifford Jones, currently a Senior Lecturer in the Department of Engineering at the University of Aberdeen and a Reader from October 2005, has published five books (with a sixth in press) and more than 230 articles on different aspects of combustion during an academic career spanning 27 years.

Dr Jones began his career in Sydney, Australia, and moved to Scotland in 1995. While living in Australia, he gained a reputation for his research into how bush and forest fires start and spread. Since working in Aberdeen he has focused on fire safety at offshore gas and oil rigs. In recent years he has also acted as consultant to a number of major chemical producers.

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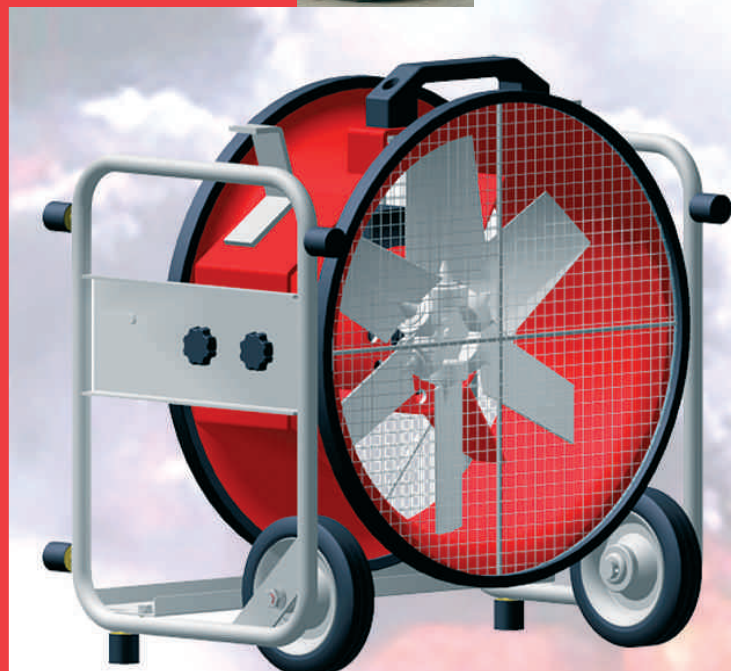
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Top Trainers In Real-Life Firefighting Environments:

Featured at Fire Department Instructor's Conference Set for May, 2006 at Bahrain International Exhibition Center

London . . . December 21, 2006 . . . H.E. Shaikh Rashid bin Abdullah Al Khalifa, Minister of the Interior of The Kingdom of Bahrain and General Abdul Latif Al Zayani of the Bahrain General Directorate of Civil Defense, like other forward-looking leaders in the Middle East, recognize that rising economic growth and prosperity demand increasing levels of professional expertise to protect life and property in civil society.

As a means to strengthening the public safety infrastructure of their country and other nations in the Middle East, Shaikh Khalifa and General Zayani have chosen to lend their support to the premier Bahrain edition of the Fire Department Instructors' Conference (FDIC), the world's leading event for leadership training, networking and equipment selection for professional fire fighters.

At this first-ever FDIC in the region, Bahrain Petroleum Company (BAPCO) and the Arab Shipbuilding & Repair Yard (ASRY), have generously agreed to make both their expert staff and technically advanced training facilities available for this unique event, staging on 6-10 May 2006.

Another key feature of what promises to be a significant milestone in the development of professional fire services in the region will be the presence of world leaders in fire training at FDIC.

Former United Nations Fire Chief Robert Triozzi, leader of the Rome based Fire Rescue Development Program, is paired with Fire Department of New York veteran John O'Connell, lead instructor for FDIC events in the US. The two are partnering with fire chiefs and other senior fire department colleagues from countries ranging from Germany, the UK, South Africa and Japan as well as leading

experts from the Middle East to ensure an exceptional training experience for all conference attendees.

A comprehensive selection of Hands-On-Training (HOT) modules will provide a series of real-life experiences for conference attendees in carefully selected sites throughout the capital city. It is anticipated that the HOT sessions, which include courses on "Structural Collapse-Urban Search and Rescue," "High Rise Fires", "Oil Pipeline Blow" and "Vehicle Extrication" amongst many others, will provide an exceptional training experience for all participating fire fighters. These will leave Bahrain with their experience and ability to perform their vital tasks greatly enhanced.

Whilst FDIC Bahrain is aimed primarily at the firefighter, it has recently become very clear that a great interest exists amongst the Middle East's construction community in the acquisition of knowledge on the latest thinking in the safe construction of High-Rise buildings and the best practice in subsequent building management in order to prevent or successfully deal with the threat of fire. To service this need, it has been decided to add a one-day special conference to the event, to stage on May 9, focusing solely on these subjects. The target audience will be the

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building construction and management sectors.

A growing roster of technical firefighting innovators supplying this industry is scheduled to be present at FDIC Bahrain, including Al Jazeera Industrial Services, Almoayyed Safety & Industrial Center, PAN GULF Fire Protection & Safety Company and The Fire Safety Engineering College amongst many others.

FDIC Bahrain is presented and managed by the UK based offices of PennWell Corporation, whose headquarters are in Tulsa, OK. PennWell is a diversified multi-media company providing authoritative print and online publications, conferences and exhibitions, research, databases, and Internet-based services to strategic markets worldwide.

Hands-On Training module definitions for FDIC Bahrain

1. Marine Fire Fighting & Rescue

This Module will be split into two work stations dealing with engine room and below deck fires. This evolution will allow the student to understand the operational needs and special fire fighting techniques required when faced with engine room and below deck fires and rescue.

The sessions will address B.A. procedures, hose handling, search and rescue procedures and fire fighting methodology in a below deck environment.

2. Refinery Fires

This module will be split into six work stations which will allow the student to gain a greater understanding of the different ways in which industrial fires involving pipe work and plant facilities are tackled. The use of six different simulators on the BAPCO fire training ground will provide a variety of scenarios in which the student will gain realistic experience in the techniques and procedures used to deal with incidents involving refinery operations. The module will cover hose handling, water supplies, use of spray and jet water streams, foam equipment and valve isolation techniques.

3. Flange Fires and Free Oil Fires

This module will provide the student with a greater understanding of the operational techniques and procedures that are required to deal with flange and free oil fires. The module will be divided into four work stations in which the student will gain experience in the techniques and procedures that may be used when dealing with these types of fire.

4. Basement Fires

The unique setting of this module will provide a realistic environment in which the student will be able to undertake training in the ways in which to deal with underground and basement incidents – including fire fighting, search and rescue, hose and equipment handling and ventilation. The students will be subject to several live fire scenarios.

5. Vehicle Extrication

This module will focus on the latest techniques and procedures that may be used to deal with road traffic accidents.

The module will be divided into several work stations including stability, vehicle access and glass, use of hand tools, use of hydraulic tools and casualty handling.

6. Hazardous Materials and Mass Casualty Decontamination

This module will address the ways in which operational personnel may deal with hazardous material incidents, and will also suggest ways in which contaminated casualties may be decontaminated. The module will be divided into four work stations, including incidents involving tanker transportation of hazardous goods, small containers containing hazardous materials, primary decontamination and mass decontamination.

7. Building Collapse Rescue

This module will provide a realistic setting in which the student will gain practical experience in the safe and proper techniques and procedures that should be used when dealing with collapsed structures. The module will be divided into several work stations including safe entry procedures, void search techniques, technical rescue equipment, shoring procedures and casualty handling.

8. Structural Fire Fighting

This module will address the techniques and procedures used when dealing with structural fires. The module will be divided into four work stations, including, breathing apparatus procedures, search and rescue, casualty handling and fire fighting techniques.

The module will be conducted in a purpose built fire house, and will provide a realistic yet safe environment in which the student will be able to gain safe practical experience in such incidents.

9. High Angle Rope Rescue

This module will address the techniques to be used when dealing with incidents that require a rescue from elevated platforms or structures. The module will be divided into four work stations including equipment, anchor points, line and rope handling and casualty rescue. The hands on portion will be conducted in a five story tower. Students will be given the opportunity to experience the needs of this type of incident, equipment types and training needs.

10. High Rise Firefighting Strategies and Tactics

The High Rise Firefighting Strategies and Tactics H.O.T. will take firefighters through the evolutions of fighting fires on the upper floors of buildings exceeding 25 meters. Trainees will go through the motions of sizing up a high rise fire, overcoming the many logistical problems involved in getting resources to the fire floor and understanding the inherent risks and unique problems faced when fighting high rise fires. They will also gain knowledge in coordinating efforts through an incident command system that will enable them to be successful at high rise fires.

Some of the procedures that will be carried out in conjunction with this training will include: Situation Size Up, Lobby Control, Forward Command, Staging of Resources, Tools and Equipment, Attack Procedures, Flashovers and Backdrafts and the Stack Effect.

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High Pressure Breathing Air – Compressors and Applications

By Kevin Bailey

Gardner Denver

If you are a user or operator of Self Contained Breathing Air equipment, eventually you will be faced with one certainty, the need to recharge your SCBA cylinders. Irrelevant of the cylinder's physical size or volume (normally expressed in Litre water capacity) or its working pressure (normally expressed in BAR) the cylinder will require the use of a High Pressure Breathing Air Charging compressor to recharge it to a required working pressure, with a suitable quality/standard of breathing air.

Static Installation

The majority of compressors for this application can be found within local Fire Authorities, Airports Fire Stations and Fire Brigades within the general industrial and pharmaceutical manufacturing plants. The compressors are located in a dedicated compressor room or SCBA cylinder charging area and powered by an electric motor. The availability of a suitable electric supply enables the compressor mode of operation and control to be automated to a varying level of sophistication, from the most basic "push button start, automatic stop" to a full micro processor controlled compressor. This enables full compressor condition monitoring of potential causes of catastrophic failure such as excessive ambient temperature, low oil level/pressure and excessive moisture in the delivered breathing air.

An example of this latest generation of dedicated

high pressure breathing air compressor technology is the PREMIAIR range, designed and manufactured by Gardner Denver Ltd. (formerly Hamworthy Compressor Systems Ltd.) at their factory in Gloucester, England. This latest design offers a static, floor mounted, 3 phase electric motor driven range of totally self contained HP BA compressors, with a range of cylinder charging rates from 210 Ltr/Min to 680 Ltr/Min. The whole range of compressors are featured in a standard acoustic enclosure whose radical design concept reduces working noise levels to between 69 to 72 DbA (1 metre free field). With the European 1st action noise level for the use of ear defenders currently standing at 85 dBA and the thoughts that this level will be reduced further in the very near future to approx 80 dBA, operators can be assured that the equipment will meet any foreseeable legislation or health and safety requirements going forward.

Typical compressor equipment of this general design is now available with Micro Processor Control technology, offering the operator many features and benefits i.e.

- A user friendly interface enabling the simple operation and general compressor condition monitoring.
- The use of internationally recognised symbols to indicate fault conditions, either as the form of a general alarm/warning or as a system shutdown facility and the prevention catastrophic failure.
- A variety of display fields, offer the operator the option of a selection of controller display information i.e. Working Pressure, Hours Run, Ambient Temperature Breathing Air Filtration Saturation level etc.
- Built in self diagnostic programmes to enable trained/competent engineers to evaluate the compressor performance level, wear factors and functionality etc.





Pic courtesy of Gardner Denver

Optional features include:

- On board compressor or remote SCBA cylinder charging facilities.
- Dual pressure charging facilities.
- Remote air intake facility.
- Increased breathing air filtration capacity.
- Continuous breathing air moisture monitoring analysis with either alarm or alarm/shut down capability.

This new generation of static, electric motor driven compressor charging sets offer a simple solution to the majority of today's typical SCBA users, guaranteeing a compressor that's fit for purpose, adaptable and flexible enough to handle the toughest of work loads and yet deliver the optimum in performance. The PREMIAIR provides optimum reliability and availability and reduced "in service" costs that are demanded in the fire station of the 21st century.

The mobile option

Alternatively, where a compressor is required to provide a cylinder recharging function at various points of use i.e. scene of a serious, remote incident and a suitably rated electrical supply is not available, then an independently powered compressor becomes invaluable. In their most basic format, these compressors are driven by either petrol or diesel engine and carried as an additional piece of emergency equipment or are permanently installed into a dedicated Breathing Air vehicle, fitted with additional SCBA cylinder carrying facility. This equipment is also found packaged in to a dedicated demountable container that serves as a convenient enclosed cylinder charging facility, providing the operator with a protected area to execute the cylinder recharging. Fitted with a suitable breathing air filtration package this compressor configuration provides high pressure breathing air to the identical quality, standards, charge rates and pressures as those of the

static/residential electrically driven format.

An example of the most advanced of these dedicated mobile Breathing Air tender vehicles, are those manufactured by the Gardner Denver Ltd. (Hamworthy Compressor Systems Ltd.) for West Sussex Fire and Rescue Service which offer a totally dedicated Breathing Air tender vehicle equipped with a large capacity, 35 CFM (1,000 Ltr/Min) cylinder charge rate, High Pressure BA compressor with a dual drive (hydraulic motor/electric motor) system. Whilst mobile or away from a suitable 3 phase electrical supply the compressor is driven via hydraulic motor driven via a dedicated hydraulic system powered from the vehicles PTO. Whilst garaged back at the vehicles home Fire Station the compressor is connected to a suitable electrical supply and powered via its 22 kW electric motor.

These transportable forms of High Pressure Breathing Air compressors facilities offer a flexible solution to many a Fire Authorities Breathing Air needs, however care must be taken to ensure that compressor suction /inlets are positioned clear of the any engine exhaust outlets or any other foreseeable contaminate source. General codes of practice recommend that every time a mobile compressor is moved, prior to its operation, its delivered air is analysed confirming it meets the required standard i.e EN12021. This not only confirms that the compressor has been located in a suitable atmosphere but also that no unforeseen damage has been caused to either the compressor or its filtration system that may have caused a failure in the supply of the required standard of breathing air.

Breathing air – the required standard

All major countries in the world have a documented standard for the quality of breathing air to be used with Self Contained Breathing Air equipment. The standard for the UK and the majority of countries within European Union is contained in the document EN12021; *Respiratory protective devices – Compressed air for breathing apparatus*. This document specifically identifies the maximum permissible contaminate levels of Carbon Dioxide, Carbon Monoxide, Water, Oil and Oxygen percentage. The maximum values of contaminate published are calculated at normal atmospheric pressure. In addition, the specification makes reference to Contaminates in general and states "in any event all contaminants shall be kept to as low as possible and shall be below the national exposure limit." National Occupational Exposure Limits (OEL) for substances hazardous to health are published yearly by the Health and Safety Executive in the UK and can be found in Guidance Note, *Occupational exposure limits (EH40)*. In the context of this European Standard "below the national limit" will mean that the concentration level of contaminate should not be greater than 10% of the relevant time (8 hour) weighted average OEL.

The common method of testing for air purity is via a specifically manufactured air purity test unit that typically uses a combination of contaminate detector tubes and electronic sensors to detect for the 4 main contaminants, CO, CO₂, H₂O, Oil and O₂ percentage. Compressor manufacturers recommend that air purity analysis is taken directly from the compressor cylinder charging outlet.

Alternatively, air analysis is taken from either a SCBA cylinder charged from the compressor. The sample taken directly from the compressor will give an operator a true indication of the compressors air purity, as with a cylinder sample there is the potential of cross contamination or the accumulation of contamination within the cylinder form previous refills.

Compressor manufacturers offer the option of onboard contaminate monitoring for moisture. This sensor will detect when the moisture level (dew point) of the delivered air reaches a pre determined threshold and will then either alarm or alarm and automatically shut down the compressor. These "on board", continuously monitoring devices should be a serious consideration for any end user, as although regular periodic testing will go a long way in insuring the supply of "to the required standard" breathing air, a dedicated monitoring system would further protect against the potential of contaminated breathing air from any potential unforeseen breakdown in filtration capacity or compressor catastrophic failure.

It is worthy to note that the majority of manufacturers breathing air filtration systems, either replacement cartridge element type or dedicated dryer packages, offer typically an active adsorption of water and to a lesser degree carbon dioxide via a molecular sieve desiccant. A bed of activated charcoal will adsorb hydrocarbon oil vapours and in general organic sourced odours – the majority of breathing air standards specifies the requirement for the air to be without significant odour or taste. With the specific use of a Hopcolite media within the filtration unit a positive conversion action of carbon monoxide in to potentially less harmful carbon dioxide is achieved.

It is recommended that both before the initial installation or commissioning of a compressor and at regular intervals i.e. every 12 months, a general risk assessment is made of a compressor location to note if any changes have been made in its immediate area or location that may be a source of foreseeable or unforeseeable contaminates.

Points to consider


Any location being considered for the sighting of a HP BA compressor will need be of sufficient size to locate the selected compressor and allow for its schedule maintenance requirements. For static electric motor driven compressors a suitably rated 3 phase power supply will be required, ideally with an isolator close to the site of the compressor. A suitably sized door access will be required to allow for the initial installation. With the majority of all manufacturers breathing air compressors up to approx 850 Ltr/Min (30 CFM) being air cooled, it is essential to provide sufficient ventilation for the compressor. This can be achieved either by a suitable sized louvered area within an outside wall of the compressor room or louvered panels within the access doors. For equipment that is located in areas of high ambient temperatures or is expected to a see extended periods of duty it is recommended to install a suitably sized extraction fan. As the dissipated heat from a typical medium sized compressor can be anything from 5.5 kW to 11 kW, it is critical that the compressor has sufficient ventilation. This will prevent the dramatic reduction in filtration process capacity due to higher compressor discharge temperatures and the potential of a mechanical catastrophic failure of the compressor.

It is highly recommended that guidance is taken from a professional organisation or competent persons experienced in the business of sizing and specifying this type of equipment and that all installation work be carried out by suitably competent persons therefore ensuring the use of correct material and components to ensure a safe working system.

Finally, due the potentially life saving function of this equipment it is essential that it is kept in optimum condition and therefore fully serviced and maintained in accordance with the manufacturers recommendations. This will need to be carried out by a company with suitably competent engineers that have sufficient expertise and experience to undertake the work. With operating pressure up to 300 BAR and filtration systems designed to supply air to a breathing air standard, it is essential to get the right man for the job!!

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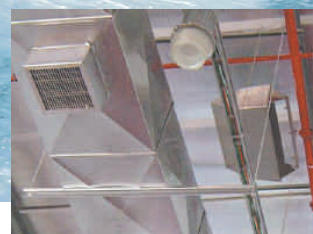
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Improving Marine Firefighting and Salvage Response

– using a non-regulatory approach through key stakeholder involvement

By Lieutenant
Joseph
J. Leonard, Jr.

Chief, Response
Department
Marine Safety Unit,
Galveston

While catastrophic marine fires are a rare event, minor shipboard fires do have a significant potential for damage and a potential impact on the marine transportation system. As such, it is critical that responders at the federal, state, local, industrial, and contractor levels be trained and prepared to conduct timely operations to mitigate any incidents that occur. Due to the nature of services performed in the firefighting community today (fire suppression, rescue, hazardous materials response, and emergency medical services, to name but a few), time and effort is not always dedicated towards responding to events onboard vessels.

As over 70% of fire departments in the United States are volunteer departments, this has the potential to become even more of an issue. In addition, shipboard fires typically require some level of participation from a marine salvor. Depending on the damage to the vessel, this may involve significant salvage activities. The number of salvors scattered throughout the United States is somewhat limited, and their home base locations dictate their response times to specific geographic areas. Critical issues that need to be addressed by senior response managers who may find themselves involved in responding to vessel fires include: 1. Establishment of an effective Unified Command to address all stakeholder issues, 2. Enhancing knowledge of regional capabilities and resources to respond to shipboard fires and resultant salvage activities, 3. Ensuring appropriate training of response personnel that meets recognized standards (such as NFPA 1405), and 4. Developing, exercising, and validating plans to respond to shipboard fires and salvage activities. Efforts throughout the Eighth Coast Guard District over the past several years have begun to address many of these issues, with enhanced incident

management training, challenging exercises to validate plans, and extensive workshops to improve responder knowledge being a few of the positive steps. Only by addressing these four critical areas can response managers be assured of an effective and efficient response that would minimize the impact to the marine transportation system.

Establishment of an effective Unified Command to address all stakeholder issues

The National Incident Management System is the standard response management system, as stated in Homeland Security Presidential Directive 5. It is designed to aid response managers in more effectively managing all aspects of a given incident. It also stresses the importance of interoperability with other response stakeholders. Very few entities are staffed and equipped with enough trained and capable resources to handle every emergency. As such, it is critically important for all response supervisors and managers to become aware of what other responders may also be on scene with them, along with their capabilities and limitations.

It is also vitally important that those relationships

be established PRIOR to an incident occurring. The incident site is NOT the place to meet your fellow responders for the first time. There will be far too much going on at that time and you will be unable to process the plethora of information regarding the capabilities of a wide variety of other responding resources. Having this important knowledge beforehand can be critical in developing effective response strategies – EARLY in the incident – that may mean the difference between success and failure.

Establishing a Unified Command also ensures that all agencies and organizations “with a dog in the fight” are represented in such a manner that their jurisdictional responsibilities are addressed.

The location of the fire will be paramount to determining who will be active in a Unified Command. If the vessel is underway or away from a dock, the vessel Master will serve as the sole Incident Commander until additional representation is available from the Coast Guard, state agencies, contracted resources, or other mariners acting as Good Samaritans.

Vessel fires at a dock tend to be a bit more manageable, as the location lends itself to an easier development of a Unified Command with available resources. Note that we do not say that a vessel fire is “easy” because it is at a dock – vessel fires are rarely described in terms such as easy or simple. . .

The initial phase of a shipboard fire is typically recognized as the “Emergency Response Phase.” This is where the fire is discovered, resources are

If the vessel is underway or away from a dock, the vessel Master will serve as the sole Incident Commander until additional representation is available from the Coast Guard, state agencies, contracted resources, or other mariners acting as Good Samaritans.

called for, and initial response activities are initiated. Typical members of a Unified Command at this time will include the vessel Master (or his successor if he is unavailable or incapacitated) and the senior fire service officer who is responding to the incident. This senior fire service officer may be a representative of a municipality or a member of an industrial fire brigade. At this stage, these two individuals have the biggest “dogs in the fight” and therefore have the lead in developing initial response strategies and tactics. Deputy Unified Commanders may include a representative from the facility the vessel is docked at, a representative of the Captain of the Port (ideally the Marine Firefighting Coordinator, if one is available), state

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agencies, and possibly a Qualified Individual, if appropriate. These representatives will initially serve at the deputy level due to their limited resources available during this phase of the response.

The second phase of a vessel fire scenario is the "Stabilization and Suppression" phase. At this time, a full Unified Command is activated with the following personnel represented:

- Federal On-Scene Coordinator – US Coast Guard Captain of the Port (COTP)
- State On-Scene Coordinator – appropriate state agency
- Local On-Scene Coordinator – Senior Fire Service Officer
- Responsible Party On-Scene Coordinator – Vessel Master of Qualified Individual
- Facility On-Scene Coordinator – facility representative

All of these members of the Unified Command have significant jurisdictional responsibilities and therefore should have equal weight in the decision making process. The Ports and Waterways Safety Act puts the key responsibility for fire extinguishment on the senior fire service officer in whose jurisdiction the incident occurs. This key point in the law, coupled with the fact that the he or she will likely have the most resources to make a positive difference on the incident, gives the senior fire service officer a sort of "lead" position within the Unified Command and most likely will have a subordinate serve as the Operations Section Chief and/or the Planning Section Chief.

Coast Guard authority plays a very critical role. Under Captain of the Port authority in accordance with the Port and Waterways Safety Act and Magnuson Act, the US Coast Guard can direct the movement of the vessel if it endangers a port, waterway, public safety and welfare. If the vessel imposes a pollution threat, then the Captain of the Port can use his/her Federal On-Scene Commander authority under the National Contingency Plan, Clean Water Act, and/or the Oil Pollution Act of 1990. Under the National Search and Rescue Plan, the Coast Guard also has the responsibility for rescuing crewmembers. Quick assessment of the condition of the vessel to determine if the vessel fire can be safely fought with available resources and where the vessel can be placed to fight the fire are decisions that will challenge both the Coast Guard and Unified Command early in the response. A disabled, deep draft vessel that is on fire and impeding a navigable waterway, such as the Mississippi River, also impacts commerce and vessel traffic. Even though Coast Guard policy states they will not be the lead for firefighting resources, they have a significant role in bringing Unified Command together, controlling a vessel and determining where a vessel can be placed (whether in a waterway, shoreside, at anchor or guided to a remote area) are critical for successful management. While Coast Guard policy is typically not to be the lead firefighting authority, the local Fire Department's and Responsible Party's (RP) firefighting representatives should lead this effort.

"Salvage and Mitigation" activities comprise the third phase. At this stage, the fire is extinguished (although what the fire service calls "salvage and overhaul" may still be ongoing) and members of the Unified Command are looking at accomplishing some key objectives. These might include

responding to any hazardous materials release or oil spill; vessel stabilization and repair; and activities to open up the waterway and available dock spaces to other members of the marine transportation system. As such, members of the Unified Command will likely be:

- Federal On-Scene Coordinator – US Coast Guard Captain of the Port
- State On-Scene Coordinator – appropriate state agency
- Responsible Party On-Scene Coordinator – Vessel Master of Qualified Individual

The Local and Facility On-Scene Coordinators may either serve as members of the Unified Command or as deputies, based on the nature of the incident. If a hazardous materials release or oil spill is present, the Operations Section Chief may come from the Responsible Party, the Coast Guard, or the local municipality. If there is no hazardous materials release or oil spill and only salvage activities necessary to mitigate the event, then a

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Salvage Master or representative of the Responsible Party will likely serve as the Operations Section Chief and/or Planning Section Chief.

The final phase, consisting of "Documentation and Cost Recovery," will likely see the Federal, State, and Responsible Party On-Scene Coordinators (or representatives) will manage this post-incident phase.

The fluid nature of the response to a shipboard fire will dictate who will comprise the Unified Command during a particular phase of an incident. Active participation by these personnel will facilitate an appropriate and timely response. Knowledge of who these other players are BEFORE an incident will go a long way to rapid and effective establishment of a successful Unified Command.

Enhancing knowledge of regional capabilities and resources to respond to shipboard fires and resultant salvage activities

Firefighters have described a shipboard fire as a combination of major structure fire, hazardous materials incident, and technical rescue – all of which are operations they deal with every day – but rarely with such unusual characteristics. In addition, firefighters will typically find a myriad of other agencies – all with their own unique resources – responding to the scene with them.

To achieve what is often termed a "best response," members of the Unified Command must be cognizant of the capabilities of these resources. It is important to note that most fire departments envision responding in the "emergency response phase" but will seldom keep large numbers of resources on-scene for long-term response and remediation efforts.

Firefighters will respond with engine, ladder, rescue, and hazardous materials companies, along with ambulances and other specialized resources (including fire boats, if they are available locally). But once on scene, they often discover the need for more specialized resources.

One of the most critical resources can be a salvage contractor, such as T&T Marine Salvage or Bisso Marine. Salvors, as they are called, can be a significant force multiplier. They can provide advice on how to access key points on the vessel to achieve rapid extinguishment. They can assess vessel stability to enhance safety of responders as well

as contributing to saving the vessel from possible capsizing or sinking. They can also assist the fire department in removing fire water from the stricken vessel, further improving stability (this is very important. . . Firefighters are known for their ability to "put wet stuff on red stuff," often without realizing the consequences. The result of putting too much water on board was discovered by the Fire Department of New York in 1942 aboard the SS *Lafayette* – more commonly known as the *Normandy* – and more recently by the New Orleans Fire Department aboard the M/V *Balmoral* (Sea).

Another important resource can be fire service contractors, such as Williams Fire & Hazard Control or Wild Well Control. A contractor of this nature brings very specialized capabilities, such as large caliber application devices to deliver an enormous amount of extinguishing agent to a fire. They also bring large pumps to support these water delivery appliances. Finally, they have access to vast quantities of specialized extinguishing agents, such as foam, CO₂, or dry chemical. Their knowledge in shipboard fire operations – often far above that of typical senior fire service responders – can be significant in developing response strategies and implementing effective tactical operations.

Hazardous materials and oil spill response contractors, such as Garner Environmental Services, may also arrive on-scene, especially if the incident is expected to be of long duration. These resources can relieve scarce fire department hazardous materials response units once the emergency response phase has concluded. They can also deploy resources to minimize potential impact on the environment or on the marine transportation system. Early employment of response contractors of this nature may facilitate a rapid reopening of any impacted areas within a port.

Lastly, we need to look at federal and state resources, which will vary based on the location of the incident.

The Coast Guard, usually represented by the Captain of the Port, will typically be the lead federal agency for most marine events. Personnel assigned to the Captain of the Port can aid firefighters in assessing vessel stability, understanding the vessel's fire plan, emplacing and enforcing safety zones, and, on occasion, providing tactical or operational support to active firefighting operations. Other resources available to the Coast



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Guard, such as Strike Teams of the National Strike Force or on-scene support from the Marine Safety Center are often several hours away.

In the Houston-Galveston area, the Captain of the Port and several response partners have initiated the formation of a Marine Firefighting Task Force (MFFTF) as an additional resource available at shipboard fires. This 111-person task force, divided into three 37-person teams, detailed in Figure 1, is designed as a bridge between the initial fire response resources and those of a fire service contractor or marine salvage contractor.

The Marine Firefighting Task Force is comprised of members of the fire service, municipal fire brigades, and the Coast Guard. It is designed to be deployed to any port area within the Captain of the Port Zone within two hours of notification and to be operations for up to twenty-four hours. Duties may include:

- 1** Serving as overhead elements for the Unified Command,
- 2** Providing tactical support to the lead fire service organization, or
- 3** Acting as the lead fire service responders, if others are not trained or available.

State response agencies may include emergency management agencies, pollution response resources, and law enforcement. State resources are also uniquely suited to address local concerns from impacted municipalities. State Offices of Emergency Management may also have emergency plans that describe response operations in the event of a shipboard fire. Appendix V of

Annex F of the State of Texas Emergency Plan is the "Catastrophic Fire Plan." This plan was developed after 9-11 to address critical shortfall during major conflagrations, including significant fires to petrochemical facilities and ships.

Ensuring appropriate training of response personnel that meets recognized standards

The National Fire Protection Association (NFPA) provides nationally recognized standards for all fire related activities, from suppression to construction to inspection. NFPA 1405 is entitled "Guide for Land-Based Fire Fighters Who Respond to Marine Vessel Fires." This comprehensive document includes a wide variety of information that any firefighter who may respond to a shipboard fire is required to know and understand.

While many fire departments spend much time and effort on training for structure fires, vehicle accidents, and hazardous materials releases, few spend significant time on responding to maritime incidents. In their defense, it must be noted that vessel fires are extremely rare. It must also be noted that the Ports and Waterways Safety Act places responsibility for responding to shipboard fires with the senior fire service officer in whose jurisdiction the fire occurs. As such, fire chiefs have a responsibility to their community to ensure their personnel are trained to respond appropriately to a shipboard incident.

Along the Gulf Coast, we are extremely lucky to be near several facilities that provide in-depth marine firefighting training, such as the Texas Engineering Extension Service (TEEX) at the Texas A&M University. Training can range from three to eight days, with specialized courses developed to meet the needs of specific departments. For the Houston Fire Department (3rd largest in the United States), this included two days of classroom instruction for personnel from all first and second-alarm companies, followed by live-fire training for chief officers, company officers, and members of the hazardous materials and rescue companies. In short order, the number of personnel trained as marine firefighters in the Houston area grew from approximately 60 to over 400. Ongoing programs conducted jointly by the Coast Guard, Houston Fire Department, and Greater Houston Local Emergency Planning Committee in and around the Houston-Galveston-Freepport area have trained an additional 200+ firefighters over the past few years.

Training is not a one-time event, however. In order to maintain that knowledge, recurrent training on a regular basis is necessary. Creative, low-cost ways can be developed to accomplish this, including:

- 1** Touring port areas to better determine potential firefighting locations and the availability of water supplies,
- 2** Ship familiarity tours, especially for vessels that make frequent port calls to specific municipalities,
- 3** Conducting short drills aboard vessels that are in port, such as stretching and advancing hoselines, removing an injured victim from deep within the ship, or establishing a water supply to the international shore connection,
- 4** Interagency training with other responders who find themselves on the scene of a shipboard fire,

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5 Meetings with incident management teams, qualified individuals, and contractors (particularly fire service and salvage contractors) to more fully comprehend resource capabilities and limitations.

Developing, exercising, and validating plans to respond to shipboard fires and salvage activities

Knowledge of vessels and how to put a fire out is all well and good, but could prove to be inadequate if there is not a comprehensive understanding of the wide variety of response plans that may come into play during an incident. One plan may address how the fire department responds, while another discusses the activities of the port authority during the incident. The local Coast Guard Operations Plan will discuss how the Coast Guard will respond to a marine disaster (Appendix 25 of Annex C) while Section 8000 of the Area Contingency Plan will delineate a more regionalized approach. State plans may also discuss response activities.

With such a large number of plans, it is critical for response managers – especially those who will find themselves as part of the Unified Command – to become familiar with their contents and the expectations various agencies and organizations have on one another. In some cases, these plans may be mutually contradictory and will have to be addressed (preferably BEFORE an incident occurs!).

Since no plan is truly complete until it is validated, exercises are developed to see how well

these plans work. Participants should include key decision makers at all levels that may find themselves involved in the response.

They can start out at tabletop exercises, where participants discuss their resources, capabilities, limitations, and specific jurisdictional issues in a non-threatening environment.

Participants should include key decision makers at all levels that may find themselves involved in the response.

The next step may be a functional exercise where participants go through one or more scenarios while covering response strategies and tactics in depth. In some cases, models may be used to more fully understand specific tactics and deployment of resources (see “Adding Realism to Tabletop Exercises” in the 1999 Proceedings of the International Oil Spill Conference for additional information).

The most detailed type of exercise is the full-scale exercise that involves the deployment of personnel and equipment. This can be a very involved and time-consuming process, but is the final step necessary to ensure potential participants understand not only their roles, but also the capability of their equipment to respond to a marine incident.

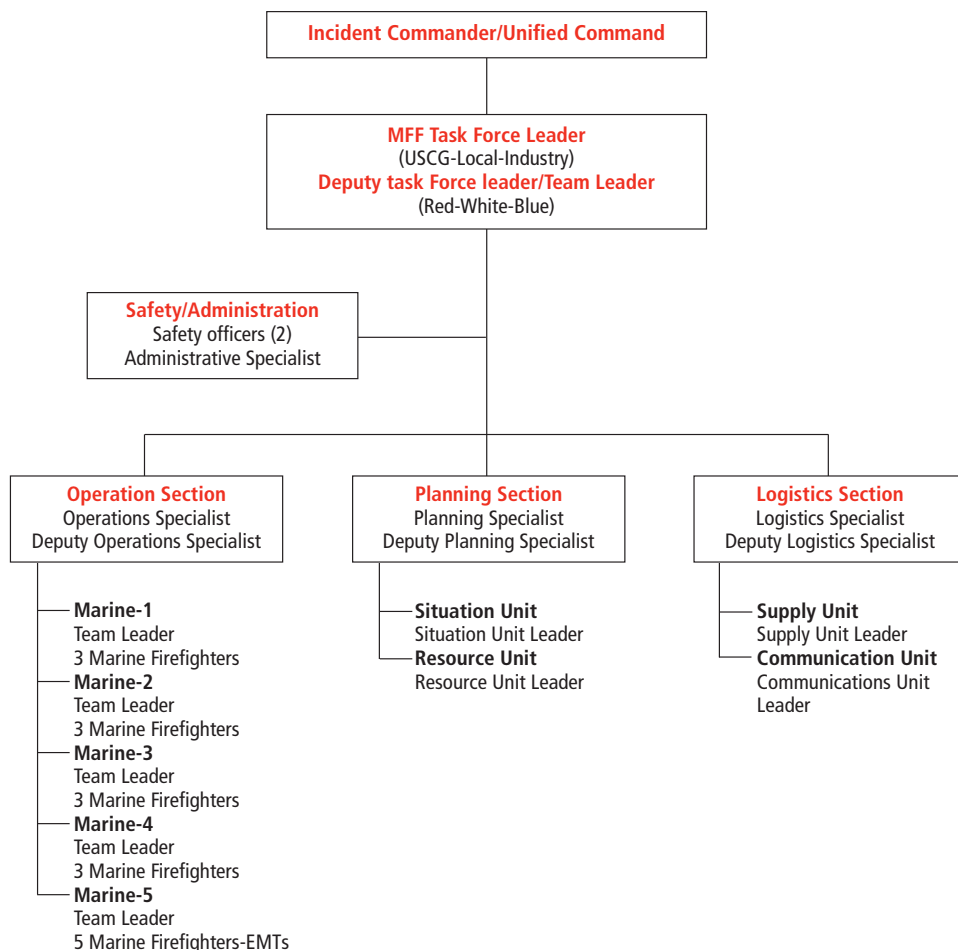


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Figure 1 – MFFTF Response Organization

General of the Army George Marshal, Chief of Staff of the U.S. Army during World War II is often credited with saying, "The plan is nothing . . . to plan is everything." That is as true today as it was over sixty years ago. The process of developing effective plans is where the critical learning will occur. Planners will discover what agencies will participate (and to what level); resource capabilities, limitations, and shortfalls; and training needs that will need to be addressed. If these planners can determine how to best ensure interoperability amongst these diverse organizations on-scene, then the foundation for a successful response has been established.

Conclusion

It is fairly easy to recognize how involved a ship-board fire could become. To minimize the impact of such a significant event, key stakeholders within the marine transportation system need to be engaged early and often – and that means BEFORE an incident occurs. Active participation in a variety of forums that exchange information on jurisdictional concerns and responsibilities, resource capabilities and utilization, training levels, and appropriate

plans that may be implemented during a crisis can spell the difference between success and failure. This active participation can facilitate the rapid establishment of an effective Unified Command that possesses the knowledge of regional capabilities and how best to implement appropriate response plans. Efforts like this minimize the impact on the marine transportation system while simultaneously protecting the environment.

Current salvage and marine firefighting regulations are still unresolved. There are spill response co-ops and salvage agreements, yet very little marine firefighting agreements specifically for marine fires. Captains of the Port should pursue initiatives with the marine industry and local fire departments in developing joint training and equipment agreements. Not having local fire departments in vessel firefighting plans would be a great mistake. Agreements reviewing mutual aid and cost sharing for fire boats and foam storage are greatly needed. If vessel owners are to provide primary firefighting resources, then local government resources need to be considered a part of the plan. We highly recommend pursuing this initiative.

IFF

Lieutenant Joe Leonard is the Chief of the Response Department for Marine Safety Unit Galveston. Commander Mike Drieu is the Commanding Officer of Marine Safety Office Savannah. Bob Royal recently retired from the Houston Fire Department and is currently the Emergency Management Coordinator for the Harris County Health Department.

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Collapse Rescue

By Clark
Staten, EMT-P

Emergency Medical
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Numerous recent disasters, in several parts of the world, should alert us to the fact that people are going to be trapped under buildings and other structures in the foreseeable future. The very nature of our technologically sophisticated and “growing taller” society continually increases the likelihood that this sort of calamity will occur. Current construction trends and population increases seem to continually expand the risks as people move further up from the ground. With the advent of the “High-Rise” buildings comes the very real concern of a “building collapse”.

Each year the buildings seem to get taller and taller and “Mother Nature” or her creations seem to take their toll of more and more of them. Earthquakes, hurricanes, tornados, and other weather phenomenon have shown a far greater capacity for destruction, than society has for building structures that will withstand the weather or earth disruptions. Both weather and ground patterns have the potential for mass destruction of both structures and the people that they contain. Manmade destructive forces also play a major role in the cause of building collapses.

Nature of the problem

Building collapse rescue is an often complex and confusing situation. It will frequently involve large numbers of specialized rescue personnel and equipment that might not be generally be recog-

nized as being part of a normal rescue organization. It should also require a combination of a variety of technical rescue skills and an advanced knowledge of building structures and materials.

When a building collapses, it generally does so in one of two ways. The building can be thought of as having “exploded” or “imploded”. The primary difference between the two types of collapse is the direction of force as it applies to the materials contained in the structure. It will also assist in a determination of the density of the debris that is involved in the rubble.

With implosion, the building will collapse into itself. It is a technique that is used by demolition specialists to minimize the spread of debris when purposely demolishing buildings. This type of collapse is likely to be caused when interior weight bearing structures lose their integrity and



subsequently “pull” exterior walls into the centre of the mass. The density, and generally the depth, of debris are greater when a building is said to have imploded.

In the case of explosion, either caused by an outward rush of force caused by natural, mechanical, or chemical forces, the building will collapse in an “outward” direction. It is likely that the debris will be more wide spread in the vicinity of the collapse, and that it could be of lesser density and depth. A tornado or hurricane can “scatter” building parts for several hundred feet or even farther, when it causes a building(s) to collapse. It is possible that victims could be “buried” under debris a greater distance from the centre of mass.

Horizontal versus vertical rescue

Most rescue experts agree that building collapse extrication must be a process of vertical removal, rather than horizontal movement or reduction. The safest way to remove debris from someone that is buried should involve carefully lifting the debris from above the victim and continually “shoring” the sides of the entrance hole or excavation to ensure against additional collapse. This is a method that is consistent with common practices used for “trench rescue”.

In the case of building collapses, the magnitude of the shoring efforts and the type of equipment necessary to perform the rescue may be very different from normal extrication. In order to facilitate vertical removal of debris, it may be essential to quickly locate and utilize various types of “cranes” and other types of “overhead lift” capabilities. It is strongly suggested that every rescue system have previous knowledge of and training for the use of heavy construction equipment. Emergency dispatchers should have access to a list of construction companies and other businesses that could provide this type of equipment on a 24 hour a day-seven day a week basis.

The importance of careful overhead lifting of debris, rather than vertical movement, cannot be emphasized enough. As many as one third of all building collapse victims, that are rescued, are found in spaces created by the way that building

materials generally fall. Most of the collapse configurations that occur (lean-to, A-Frame, tent, pancake) create “voids” in which people may be trapped and remain alive. Vertical movement of debris will normally further collapse the sides of these “protective spaces” and can result in additional deaths of those that might have been rescued.

General building collapse rescue guidelines

1 As one might expect, immediately after a collapse, the debris of the building is very unstable and prone to additional movement. Rescuers must assess the nature of the scene and the pattern of the collapse before entering onto a pile of rubble to insure their own safety and that of those potentially buried in it. Shoring may be necessary to prevent movement, before attempting rescues.

2 Gather as much information as is possible at the onset of the incident. “Intelligence” regarding the last known locations and activities of those believed to be in the structure will greatly assist in developing a plan for recovery efforts. Concentrate your preliminary efforts on areas where people were last seen or known to be. It is suggested that a “Command” person be designated to interview those that may have escaped the collapse, were eyewitnesses, or were in the building and rescued early in the effort. Obtain a list of the people normally in the building, if one is available.

3 After ensuring rescuer safety and minimal movement of the debris, send small-organized teams to the top of the pile and systematically search the surface in specific grids. Use barricade tape and markers to visually demonstrate the areas that have been searched and those that could potentially contain victims. As many as one half (½) of all building collapse survivors have historically been rescued near the surface of the debris and early in the effort. Concentrate your efforts on those areas that are believed to be the last known locations of people, when the collapse occurred.

4 CALL for Help!! It normally will be necessary to activate some sort of disaster plan for large scale building collapses. This type of rescue is very manpower intensive and may require large numbers of extrication and medical personnel. Call for the "overhead lift" capability that you will need, as soon as it can be determined that people are missing or still trapped. Remember . . . it is likely you will need some method of "cutting" concrete and the steel reinforcing bars ("Rebar") that are contained within most modern buildings. (i.e. torches, hydraulic cutting tools, saws).

5 Explore visually, or with mechanical devices (closed circuit/fibre optic T.V.), all possible "voids" that are open or can be reached by removing surface debris. It is suggested that, at approximately every hour on the hour, all work at the site be shut down for a few minutes to listen for calls for help. During that period, sound detection devices can be used to "listen" for movement or sounds deep within the debris. Call for "Search Dogs" and handlers, as they are available in your area or region. (Have the equipment and dogs on a dispatcher's resource list with the heavy equipment contractors/operators)

6 Continue to remove debris . . . carefully and vertically, searching each "void" or entrance to a "void" as it becomes available to the rescuer. Consideration must be given to the fact that the rescue effort is NOT over until EVERY reasonable effort has been expended. Expect these types of rescues to last days . . . especially when multiple buildings are involved (earthquake, avalanche, etc). People have CONTINUALLY and HISTORICALLY been found alive many hours and days into the rescue. Have command, media relations, and logistics officers plan for a multiple day operation when people are still suspected of being missing and their bodies have not been recovered.

7 Great care must be taken when a person is located, either dead or alive, to ensure that additional collapse doesn't occur in the area of their entrapment. Rescuers should use their hands and small tools to remove the remaining debris surrounding a person. The victims condition may dictate the speed with which rescue efforts progress. Consideration should be given to early application of Military Anti-Shock Trousers for viable persons that have "crushing" injuries. Preparation and the beginning of application of them should take place as soon as the entrapment permits. Several instances of complete hemodynamic collapse and death have been noted upon release from confinement. Intravenous solutions can also be administered by qualified EMS personnel as extrication continues. Caution should be urged in the use of morphine or other painkillers.

8 DO be prepared for the emotional and psychological implications of the incident. Prepare early for Critical Incident Stress debriefing sessions for rescuers, victims and families. It is strongly suggested that mental health professionals and crisis intervention be made available to the families of those believed trapped, at the earliest opportunity. The stress of protracted digging, discovery of disfigured remains, odd smells and sights can affect even the most hardened of rescue professionals.



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Supervisory personnel may want to set aside a special place for families and psychological care near to, but off of the rescue site. To do otherwise will invite charges of insensitivity, and probably prompt the families to attempt to enter or stay in the rescue area.

9 Relief for both supervisory and field rescue personnel must be forthcoming. Even though most rescuers will insist in continuing their efforts for many hours, they lose a large part of their effectiveness after 18-24 hours or less. Ensure that all rescuers eat and rest at frequent intervals, as circumstances permit. Prepare to (and do) call in off-duty or mutual aid personnel, as they are needed. Stage all extraneous units in a planned way and avoid having more personnel on-site than can effectively work at one time.

10 During long term or at major rescue operations, expect extreme "media" coverage, including the national and international press. Be prepared for analysis and commentary of your every move. It is suggested that this scrutiny can be somewhat averted by appointing a designated Public Information Officer (P.I.O.), and by planning and giving frequent press briefing and updates. Include "front-line" rescuers and technical experts that you may be utilizing in the effort. During the early stages of the event, give these briefings hourly in an area adjacent to the site and provide as much information as you can actually verify. As the length of the rescue increases, plan a morning and afternoon news conference. It is suggested that someone monitor press activities on a constant basis, in order to be able to anticipate the questions and concerns of the media. Be as forthcoming as possible, without compromising the integrity of the rescue operation, the victims, or the families of the victims.

11 Anticipate the need for additional resources that you haven't thought of prior to this event. Be prepared to obtain architectural drawings of the building(s) affected. How about gas mains, water pipes, or electrical services that are disrupted? You may want an aerial perspective of the scene . . . do you know where and how to get overhead photos of the collapse? How are you going to feed "hundreds" of construction workers, rescue workers, families, and others, who may be there for days? Who's going to pay for what? Will you need a city/county-purchasing agent on-site to approve the immediate purchase of your needs? Ensure that you have planning and logistics officers who can anticipate these needs and fulfill them within a moments notice. Often . . . the difference between what is perceived as a completely successful rescue and a "disorganized" one is the quality of your planning and the careful execution of your contingency plans.

12 Particularly in multi-story buildings are prepared for the possibility and likelihood of underground or cave- type rescue procedures. This type of specialized rescues requires those experienced with climbing (ascending and descending) maneuvers and the use of technical rappelling methods. Each rescue team (minimum of two rescuers) going "underground" should have a safety rope attached and be in constant communications by

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radio with the surface. They should also possess a minimum of three viable light sources. Hose rollers and other types of "rope slip devices" must be used, as to avoid the sharp edges of concrete that will abrade normal rescue ropes.

13 IT AIN'T OVER UNTIL IT'S OVER! Generally speaking, you will be criticized for any early termination of rescue efforts, if there are still people missing or bodies not recovered. A rule of thumb says it's over when everyone is accounted for or the "field is cleared" (of debris). Practical application says that you will probably scale back the aggressiveness and scope of the effort after several days of rescue, but that you should remain aware of the fact that people have been successfully rescued alive after as much as twelve (12) days . . . buried in the rubble of an earthquake. In the March, 1992 Turkish earthquake, a 22-year-old nurse was pulled from beneath a building collapse after eight days. She was also quoted as saying that she had been "talking with her two friends", who were also buried, for several days after the collapse . . . until she "didn't hear them anymore". The thought of someone remaining buried alive for several days should be enough motivation for most rescuers to continue with their efforts until every possible hope has been exhausted.

14 Establish on-scene (and separate) communications (Radio, Data, telephone) connections and expect problems with being able to coordinate with many differing agencies. It might be suggested that a "common" disaster frequency might be designated in preplanning sessions for the initial response to the incident. Once on-scene, the Incident Command team may need to establish several different "nets" of units or agencies and have a common dispatch centre at the command post. Anticipate the need to constantly communicate with construction workers (crane operators) and their supervisors, and probably a dozen other agencies that you never thought of. Also remember that the need for coordination with local and state police may become necessary for crowd/access control and other purposes. Often police agencies will become involved in securing the remains of fatal victims in a temporary morgue at the scene.

15 EXPECT THE UNEXPECTED! Regardless of the thoroughness of your contingency planning efforts and the diligence of all of the people involved in the rescue, something will become a problem that no one has anticipated. This is just another opportunity to demonstrate the quality, commitment, and dedication that comprises the makeup of most rescue organizations . . . let the improvisational ability of the fire-fighters, EMTs, paramedics, police officers shine through!

Conclusions

One of the most difficult, emotionally draining, and technically complex types of rescue can be a building collapse incident. The keys to a successful rescue are pre-planning, practice, and perseverance. By learning more about this increasing commonplace event, we can be better prepared to save lives and alleviate the suffering of its victims.

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An emergency situation, fire or explosion can have a catastrophic impact on people, property and the environment. In the course of our day-to-day lives, we as individuals rely on the fire and emergency services to contain and extinguish such incidents. What happens therefore, in isolated or harsh environments, compounded by the presence of hazardous and combustible materials, when such an incident occurs? The emergency services cannot reach the scene quickly or easily and therefore dealing with the situation is a challenge which must be faced by those in the immediate vicinity.

Hundreds of thousands of people are employed in the global oil & gas market, many of them visiting or working on a rotational basis on offshore installations or remote onshore locations. In the unfortunate event of a fire or emergency situation on these installations, it befalls to safety systems and the platform's fire team to mobilise, respond to and deal with the emergency. This team must contain and extinguish the fire safely, for the sake of themselves and their onboard colleagues.

The fire team comprises a number of the platform personnel and their roles within the team are in addition to the day-to-day responsibilities that they hold elsewhere in the operation. In the event of any emergency situation, they must contain their work, muster, await instructions, and then tackle the problem as a team, safely. This approach cannot be attained without the highest levels of

fire and emergency training and response, and although there are many companies across the globe offering such training, the pioneers of fire training for the offshore industry, **RGIT Montrose**, still believes it is at the forefront. The company truly believes that the realism of their extensive training facilities, combined with first class and professional instructors enhances the training experience, ensuring the delegates are as prepared as possible should a real situation occur in the course of their career.

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RGIT Montrose facilitates the development of these teams by training and coaching individuals in the principles of responding to an emergency effectively as part of a fire team, and trains the delegate in the most realistic environment. The facilities at Montrose enable **RGIT Montrose** to provide a unique training experience for delegates on specially designed modules, which closely replicate the equipment and systems they are likely to be familiar with, on-board offshore installations or onshore facilities.

RGIT Montrose facilitates the development of these teams by training and coaching individuals in the principles of responding to an emergency effectively as part of a fire team, and trains the delegate in the most realistic environment.

Delegates at the facility undergo intensive training, combining classroom theory with practical experiential training to ensure that they have the knowledge, skills and ability to operate safely and effectively.

Eight fire training modules dominate the site at Montrose. One of the most impressive, a three-storey training module, is one of the largest

structures on the training ground. It is used for both offshore and onshore simulation, principally demonstrating gas and hydrocarbon fire fighting techniques across all three levels. Extremely adaptable, the module is also used to train delegates on internal fire fighting and rescue work, with delegates demonstrating their ability to deal with severe heat, smoke and poor visibility conditions.

A further two storey module boasts a full size helideck which can simulate a heavy landing or a low impact crash scenario with the helicopter on its side, and has the capability of re-enacting an (environmentally friendly) full size burning helideck allowing for exercise scenarios with foam monitors and ancillary equipment to be performed.

An extensive two storey simulation production and process module, known as the offshore installation module provides delegates with experience of gas and hydrocarbon pressure fires and hydrocarbon spills. The module simulates fires from wellheads, flanges, ruptured pipework and vessels with flame impingement on structure and vessels.

Taken directly from an offshore platform, the accommodation module can be used for search and rescue operations in smoke filled compartments, and essential breathing apparatus training. The module can be used to simulate training for both onshore and offshore living accommodation. In addition, the purpose built breathing apparatus training unit contains a network of smoke filled tunnels and construction levels, including the basement level, access and egress points, from which essential breathing apparatus and confined space entry training can be performed.

All modules have been designed and built over the last two decades, in conjunction with training facility personnel, ensuring they are closely mirroring industry facilities and equipment and are extremely realistic and fit for training purposes. Whether based on the helideck, the platform or the accommodation module, the training scenarios

Night Time Fire training exercise



are intended not to create fear or concerns for delegates but rather to create the highest possible levels of competence, which can only be generated from realistic experiential training simulations.

Fabricating and welding workshops support the training provision on offer, with all equipment being maintained on site. The facility is specifically split into 'clean' and 'dirty' areas to ensure that

pre-exercise and de-brief classroom based sessions can be undertaken in a conducive environment without the need for delegates to continually remove outerwear during sessions, and the whole facility is supported by first class changing areas and catering provision.

RGIT Montrose places enormous importance on the quality of training that each delegate receives. Already recognised as a world leader in fire training, the company aims to re-inforce and cement its reputation. To that end, RGIT Montrose goes to great lengths to ensure that the instructors at the fireground are of the highest calibre.



The facility is specifically split into 'clean' and 'dirty' areas to ensure that pre-exercise and de-brief classroom based sessions can be undertaken in a conducive environment without the need for delegates to continually remove outerwear during sessions.

Instructors are recruited from a variety of specialist backgrounds, including the military and civil fire services, and the company also employs specialised pharmaceutical fire advisers and oil and gas experts. The instructors have significant expertise and experience in the provision of fire training in a safe and controlled environment, ensuring that delegates receive maximum benefit from the instructor's extensive experience, should the delegates' training ever be called upon in a real life scenario.

Innovation in training and consultancy

RGIT Montrose delivers over 30 fire training courses to set and accredited industry standards including those set by: The Offshore Petroleum Industry Training Organisation (OPITO), Marine Coastguard Agency (MCA), Oljeindustriens Landsforening (OLF), and Joint Oil and Industry Fire Forum (JOIFF).

In addition to these courses, they provide advice on a range of services to ensure companies keep in step with new legislation including fire and safety audits and risk assessment for corporate fire safety plans. RGIT Montrose has a unique capability, which enables them to work closely with clients in order to prepare training courses directly tailored to mirror the operational procedures and working practices of a single company or installation. Continually working closely with clients in this way and ensuring that instructors have regular offshore visits ensures that the training methods and facilities provided are continually exceeding the requirements of the individual delegate, clients and the industry.

In addition to these courses, they provide advice on a range of services to ensure companies keep in step with new legislation including fire and safety audits and risk assessment for corporate fire safety plans.

An example of this innovative approach is the recent introduction of night time fire training. An emergency occurring during the hours of darkness can add new dimensions to the response approach. Therefore, additional night time exercises have been incorporated into the standard Further Team Member course, in order to highlight the potential difficulties and risks which the emergency response team could be faced with when responding to an incident in total darkness. This course can also be tailored to meet company specific emergency response team training requirements. *(For a full range of courses see right.)*

Roots within industry

RGIT Montrose was the pioneer of fire training for the oil & gas industry in 1979 and the Montrose facility was the first of its kind in the world. Created by industry for industry by the visionaries of that time, the ethos of the fire training school has remained resolute across the decades and has been enhanced with the onset of technology within industry and in training methodology itself.

Realism and experienced staff are the keys to the success of RGIT Montrose's internationally renowned facility. The company is continually reviewing its operations and facilities to ensure that they continue to stay at the forefront of training delivery, incorporating changes in working practices and the continual impact of amended legislation and company procedures.

Accredited training provides a single benchmark

Summary of Courses Available	
Course Title	Duration
Breathing Apparatus Wearer	1 Day
Confined Space Entry	1 Day
Confined Space Entry and Rescue Team Training	3 Days
Fire Extinguisher Training	2 Hours
Fire Risk Assessment	Dependent on requirements
Fire Warden	4 Hours
Fishing Officers Fire Fighting	1 Day
Further Offshore Emergency Helideck Team Member	2 Days
Further Offshore Fire/Emergency Response Team Member	2 Days
Further Offshore Fire/Emergency Response Team Leader	2 Days
Further Offshore Fire / Emergency Response Team Member (incorporating Night Time Fire Fighting)	2 Days
Gas Testing Awareness	½ Day
Helicopter Landing Officer (HLO)	2 Days
Helicopter Refuelling	2 Days
Helideck Assistant	1 Day
Hydrogen Sulphide (H2s) Awareness	½ Day
Merchant Navy Advanced Fire Fighting	4 Days
Merchant Navy Basic Fire Fighting	3 Days
Offshore Emergency Helideck Team Member	4 Days
Offshore Fire/Emergency Response Combined Helideck and Team Member	6 Days
Offshore Fire/Emergency Response Team Member	5 Days
Offshore Fire/Emergency Response Team Leader	4 Days

for operators and contractors alike. Undertaking courses such as the ones on offer at RGIT Montrose provide demonstrable proof of competence in delegates participating in the fire teams. However, whilst the principles of accredited training are the same the world over, RGIT Montrose believes that its experience, competence and unique facility at Montrose sets it apart in the training provided, and therefore, delegates trained at their facilities over the years have benefited from receiving **'real life training from real life experts'**. **IFF**

A division of Petrofac Training, RGIT Montrose is the safety training arm of the Petrofac Group, with a presence and capability in all the major oil and gas producing regions of the world, providing a range of safety training in Fire, Survival, Health & Safety, Major Emergency Management and Marine.

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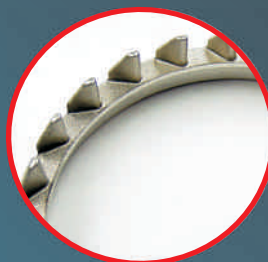
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Questions about anything manufactured by TFT? Locate the serial number, contact your distributor and don't worry about it. We can track: the manufacturing date, who it was sent to, warranty (5-year warranty), provide spare parts, maintenance instructions, exploded view documents, etc...



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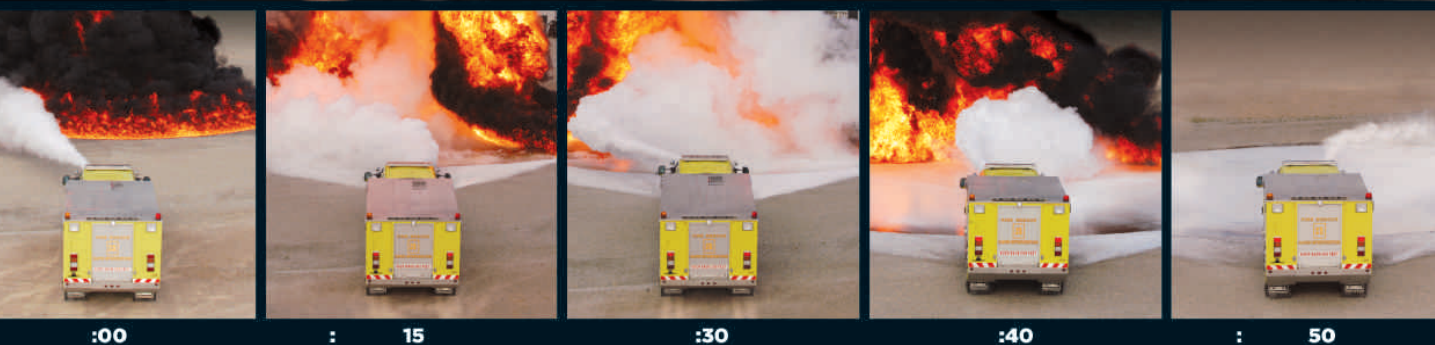
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May 2006 Issue 10



Front Cover Picture: A fire engine sprays water on the world's biggest passenger aircraft Airbus A380 as part of a welcoming ceremony after its maiden landing at the Kuala Lumpur International Airport (KLIA) in Sepang on November 17, 2005.
Pic courtesy REUTERS/Kamarulzaman Russali

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Thermal imaging just got hotter

The Argus[®]4

Want to know why e2v's Argus[®]4 is the hottest thermal imaging camera on the market? It's half the weight and size of our revolutionary Argus[®]3, has all the features and is more cost effective.

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Cutters Edge shows versatility of their Rescue Saw Team at FDIC Show in Bahrain

CUTTERS EDGE, a company based in Julian, California, showed attendees at the recent FDIC Show in Bahrain live demonstrations of their three rescue saws.



Cutters Edge provided saws for use in Hands On Training (H.O.T.) classes two days prior to the actual show opening. Trainees helped demolish a building then practiced rescue techniques used in a building collapse, with all three Cutters Edge Rescue Saws.

Christian Ruzich, Vice President of Cutters Edge, also performed live demonstrations at the front entrance of the Exhibition Hall during the show to show the versatility, portability and

outstanding cutting performance of the three rescue saws, including:

- The MULTI-CUT Fire Rescue Saw with BULLET® Chain. This saw is the original member of the Cutters Edge team and showed why it is used throughout the world for fire rescue operations to cut through wood, rubble, shoring, sheet metal, plastic, glass and much more with quick efficiency and maximum safety for the operator.
- The CE101C Concrete Cutting Chain Saw with Diamond Chain cuts reinforced concrete up to 36cm thick. This powerful chainsaw demonstrated fast cutting of search holes, rescue cuts and more to attendees of the show.



- The MULTI-CUT Rotary Rescue Saw with Black Star Diamond Blade™ is the newest member of Cutters Edge rescue team and the most versatile. Attendees watched this saw cut any and all materials and were interested in its industrial applications, especially for use in oil refineries and in oil fields. According to Cutters Edge their exclusive Black Star Diamond Blade not only cuts any material, wet or dry, it lasts up to 100 times longer than any standard rotary saw blade.

Cutters Edge Rescue Saws are used throughout the world and sold through an extensive distributor/dealer network.

For more information contact
Cutters Edge at +1-760-765-0597
or visit www.cuttersedge.com

Japanese Deflate In Favour Of Metal Frames

PPS Secures Osaka Airport RD Shelter Order

An order for six rapid deployment shelters has been placed by the KIAC company with PROFESSIONAL PROTECTION SYSTEMS. KIAC are the company responsible for providing facilities of all kinds at Japan's airports and the six shelters, the first of a much larger order, are destined for Osaka airport.



The shelters, all based on the design of the metal frame units, which PPS has supplied to the UK government to house its mass-decontamination facilities, represent a major change in Japanese thinking which until now has been centred on inflatable units.

According to Mark Whitcher, PPS Managing Director, the change in thinking was based upon the longevity and flexibility of metal frame systems and the fact that they do not spring leaks and if damaged can usually be repaired with great swiftness and relative ease. "This plus the fact that they can be deployed with the same speed as an inflatable clinched the deal I believe" says Whitcher.

Internally the spatial arrangements of the shelter interiors allow for a number of different uses; as command posts, field hospitals, scene of crime operational centres and so on.

Japan's emergency services and defence forces are already familiar with PPS equipment and are amongst the company's earliest export customers, buying the then revolutionary PPS inflatable decontamination shower in the wake of the infamous Tokyo Sarin attack. "Because of this I believe the Japanese have faith in us and what we have to offer, and this must have contributed significantly towards getting them to change from inflatable to metal frame technology and to placing the order with us" comments Whitcher.

More information from:
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'Mission Impossible' achieved by Wolf

The combined lightweight and exceptional light output features of the innovative Rechargeable Torches from WOLF SAFETY represent fulfilment of a 'mission impossible' by the company's research and development team. For many years the company has had to advise its customers that they could not have lightweight and high power together.

With new technology in the form of ultra-lightweight, high capacity Lithium-ion rechargeable cells, and LEDs with efficiency levels, exceeding that of the best tungsten halogen lamps, Wolf's R30 and R50 rechargeable torches offer the market the product it has been demanding for so long.

Enclosed in a similar high-grip ergonomic form as Wolf's popular ATEX Safety Torch, launched in 2002, the lightweight R30 model weighs just over 300 grams and the more powerful R50 3 Watt LED version, under 400 grams.

At five metres the R30 provides peak luminous intensity of 340 lux, the R50 model 360 lux. On full power, light duration is a full three hours [six hours on half power]. An 85% recharge takes only 90 minutes in the charger configured as a torch holder.



Wolf Safety's rechargeable torches combine lightweight and exceptional output features

The R50 LED model is now coming through production, with the first substantial order being supplied to an important UK Fire Brigade who selected

the Wolf product from a shortlist of five competitive products, following extensive tests and assessments.

Already, orders for Wolf Safety's R30 Halogen bulb model which has only been on the market for two months have been received from UK customers and others in six European countries, Australia and the Middle East.

For more information, please contact Wolf Safety on 0114 255 1051 or visit the Company's website at www.wolf-safety.co.uk

Introducing the New Argus® 4 – Thermal Imaging Just Got Hotter!

E2V TECHNOLOGIES, the manufacturer of the hugely successful Argus® thermal imaging cameras, has announced the arrival of the next generation in thermal imaging technology – the Argus® 4.

The Argus® 4 is smaller and lighter, yet packed with even more features than the Argus®3, which was in itself groundbreaking in becoming the first camera to offer image capture. Argus®4 comes with x2 zoom, 14 colour settings and a picture capture facility capable of taking 100 pictures. However, at only 135mm tall and weighing only 1kg it is under half the weight of the Argus®3.

The Argus®4 enables 100 photographs to be stored then downloaded to a PC/Laptop through a USB cable for quicker

transfer. Combined with the 14 colour schemes, with their built in improved usability, the Argus®4 just keeps delivering.

Argus®4 utilises an industry standard Microbolometer sensor matched with electronics designed and manufactured by e2v which ensures that quality and durability are built in. A brigade's own logo can be uploaded onto the Argus®4 splash screen, enabling improved asset tracking. Direct (spot) and ambient temperature measurement are also standard features on the Argus®4, allowing for accurate assessment of site temperatures and identification of specific danger points.

The Argus®4 is sealed to IP67 and has also been manufactured to survive a 2m drop test and to tolerate high temperatures.

Andre Goodson, Fire Business Sector Manager at e2v technologies, explains: "After the global success of the Argus®3 thermal imaging camera, e2v was determined to introduce a new camera which met fire fighters' demands to have a small, light camera which is still full of features. Prior to the Argus®4, all the cameras on the market were either large



but full of features, or small but basic. Argus®4 bridges the gap between size and functionality and set a new gold standard in the field of thermal imaging cameras!"

For further information about the Argus®4 camera visit www.argusdirect.com or call +44 1245 453443

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Peli safety torches and protector™ cases

Peli's high quality torches and Protector cases have become the choice of professionals. Those who demand reliability, performance and durability in all the equipment they use, find Peli products perfect for use in the most demanding conditions.



All Peli products are backed by the legendary **"you break it – we replace it" LIFETIME guarantee*** (*excludes shark bite, bear attack and children under five). Peli have confidence in their products and pass that confidence on to their customers. Peli Products (UK) Ltd. give customer satisfaction priority and operate a no quibble warranty replacement policy. This includes dealing with any warranty returns within 2 working days.

The full Peli range is held in stock at the company's 10,000 sq ft distribution facility in Glossop, Derbyshire, enabling speedy fulfilment of customer orders. Peli Products (UK) also offer free next day delivery on standard orders within mainland UK.

Intrinsically safe torches

Peli's professional torches combine quality manufacture and materials with cutting edge technology. The range is comprehensive; with ATEX Zone 0 and zone 1 torches as well as new LED models.

Peli's Recoil LED torches have proved hugely popular with Fire & Rescue Services throughout the UK and Europe.

Recoil LED technology directs the light back onto the reflector to focus it into an impressive white, collimated beam to rival conventional torches, but with the durability and efficiency of LED. This collimated beam will cut through smoke and fog, making the Recoil torches ideal for all search and rescue tasks.

Recoil torches are now available in a range of models. The **StealthLite Recoil (model 2410)** has a pre-focused LED Beam of 32 lumens and 32 hours of battery burn time. The 2410 features a side-mounted switch for one-handed operation



and/or helmet mounting and it is fully submersible.

The Little Ed right-angled torch is now available as the **3610 Little Ed Recoil**. With a 32 lumen beam and 32 hours of battery burn time, this recoil version features a stainless steel clip to attach it to a coat for hands-free use.

The high temperature rating (T4/T5) on the ATEX certification of the Recoil models is due to the lower heat output of LEDs compared to Xenon or Halogen lamps.

Peli protector cases

Peli Protector Cases offer crushproof, watertight protection for fragile or valuable equipment. They are ideal for transporting communications, photographic or electronic equipment safely and have an established reputation for performing in the toughest conditions.

Produced in 25 sizes for a variety of user requirements, Peli cases are manufactured from an incredibly light structural resin shell that does not dent and have an extra thick wall construction. Peli cases now feature easy-open double-action latches, reinforced stainless steel padlock protectors and improved grip handles. Pick n' pluck foam inserts and padded divider systems are available for cushioned protection against impact, vibration and shock.

The larger Peli cases also feature wheels and extendable handles for easy transportation of heavy or bulky loads.

IFF


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Fax: 01457 869966

Website:

www.peliproducs.co.uk

The solution to uncomfortable and underperforming station shirting is at hand



MELBA INDUSTRIES, Australia's leading textile manufacturer, in conjunction with WoolMark and the CSIRO (Commonwealth Scientific & Industrial Research Organisation) have developed a range of high performance knitted fabrics called MelbaEdge and MelbaMax.

MelbaEdge/MelbaMax, a specialised wool blend, is the solution to many problems faced by the extreme and varied climates faced by today's firefighter.

MelbaEdge/MelbaMax technology utilises revolutionary fibre and spinning technology to offer a wool blend fabric dedicated to keeping firefighters dry and comfortable. The secret to why this fabric outperforms other competitive fibres on the market is thousands of years old – wool. Wool is nature's performance fibre providing you with the best environment for natural all round comfort. Wool has the unique ability to breathe which helps to keep you warm when it is cold and cool when it is hot, and comfortable all day long under extreme conditions. However, this system only utilises fine wool technology. The fabric offers outstanding comfort attributes.

Wool has the natural ability to transfer body heat in vapour form. The body vapour passes through the core of the fibre whilst the outer sheath stays dry. Other common fibres such as cotton, polyester or cotton blends can detract from a firefighter's performance and comfort. They take in sweat – basically they act as a sponge. This simply adds to the fabric weight, the wearer can become chilled. More importantly, MelbaEdge and MelbaMax continue to breathe and move body vapour when they are worn under full turnout systems. Heat stress is an issue

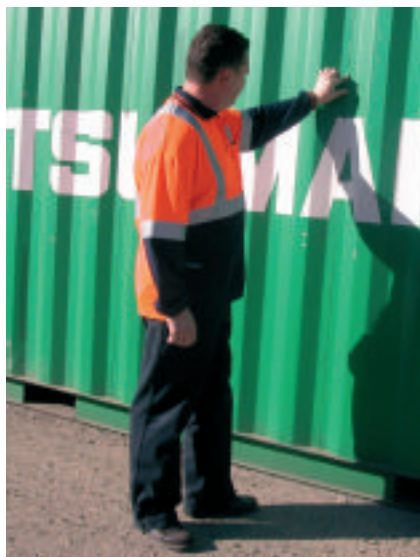
dominating the firefighting market. We are all looking at ways to reduce the impact of heat stress. As the first layer in a firefighter's ensemble MelbaEdge and MelbaMax assist in the transfer of body heat through the system – keeping the wearer drier – more comfortable – more able to complete their duties.

Why does MelbaEdge and MelbaMax work so well? It's simply due to the complex make-up of the fibre, and it's unique ability, over other fibres, to change in different environmental conditions. Basically a chemical reaction occurs, there is an electrical attraction between water vapour molecules and the internal chemical structure of the wool. This reaction enables wool to control a wearer's micro-climate. Not only do these two fabrics breathe better than other commonly used fabrics, they are also extremely easy to launder, they offer excellent lightfastness characteristics and garment shape retention.

In review MelbaEdge and MelbaMax offer:

- Outstanding breathability
- Keeps you cool when it is hot and warm when it is cold
- Transfers body vapour even under turnout systems
- Excellent lightfastness
- Easy care features
- Durability and garment shape retention
- Inherently Flame Retardant (Melbamax) or Flame Retardant Treated (Melbaedge) – for the life of the garment.

Please contact Rob Walsh on robert.walsh@melbaind.com.au for more details.



Qatar Civil Defence Authority specifies Bristol PPE

Close collaboration with their local distributors and on-the-ground support from the company's export sales team has been instrumental in BRISTOL UNIFORMS securing a major new contract with the Qatar government for firefighter clothing for the Gulf state's Civil Defence Authority.

In competition with an estimated 15 other PPE suppliers from a number of different countries the tender for 2500 sets of fire coats and trousers and 1200 pairs of gloves was eventually won on Bristol's ability to provide a unique combination of style, comfort and overall wearer protection. The fire kit being supplied is based on

Bristol's most recent lightweight design, the Ergotech Action™, incorporating a Titan outer layer with a Gore-tex Airlock™ moisture barrier.

Hitherto Qatar's Civil Defence force had relied on their station wear as front line firefighting PPE. However the major shortcomings of this policy became apparent over time and the Civil Defence Authority decided to upgrade their specification to meet EN469.

In a rigorous tendering process during which PPE trials were carried out representatives of the Civil Defence Authority visited Bristol Uniforms to inspect Bristol's design, manufacturing and quality control capabilities before finalising the style which has now been incorporated in the order which will be delivered in the early spring of 2006.

Commenting on the company's success, Paul Gibson, Bristol's Regional Export Sales Manager said, "International competition was especially strong for this major contract and I am delighted with the key role which our distributors, Chubb Fire Qatar, played in helping us secure the business. This is another example of our new lightweight PPE constructions providing the right balance of protection and comfort features to give us that competitive edge we need to continue to expand our presence in overseas markets".

For more information about Bristol Uniforms or Bristol Care please contact either:

Roger Startin, Bristol Uniforms Ltd on 0117 956 3101 or email roger.startin@bristoluniforms.co.uk
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Bohus Innovation

Clean Sweep and BoomVane vessel sweep system



These complete systems are now part of the coast Guard's larger (40 meter) skimmer vessels equipment. This vessel has approx 15 meter jibs and built in Lori brush skimmers, as well as RIB on the aft-deck. New exercises were performed in 2003, 2004 and in January 2006 addressing one important issue:

Can the sweep speed be increased beyond the typical 0,5–1,0 knots of conventional "U"-sweep by inducing a drag in the down stream opening of the "U" and thus achieve a "V"-sweep to avoid

entrainment of oil under the boom before it reaches the downstream opening?

Also, the Coast Guard wanted to ascertain whether their 40 m skimmer vessel could be completely self-supporting in a fore-sweep + skimmer vessel configuration by using a on-deck carried work boat (in this case a 7 m/450 hp rescue RIB) to tow the BoomVane sweep. This turned out to be very simple – a drawing of the deployment procedure is also included.

Two photos taken from skimmer vessel: the first without a sea anchor, the second with one, to induce the desired drag. The sea anchor used was unnecessary large but that served a purpose as well: it shows that the BoomVanes can handle a considerable drag and that doubling the length of boom used in the latest trial when the sea anchor was replaced by a small vessel hooked to the boom opening worked very well without any problem.

The conclusion is equally clear from this exercises – a wide swath sweep with speeds of 2–3 knots without entrainment is reality.

The sweep system is a co-operation between the two Gothenburg based companies ORC AB and Bohus Innovation AB.

The BoomVane is designed and manufactured and property of ORC AB and the "Clean Sweep" is designed and property by Bohus Innovation AB.

IFF



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HAIX® – Shoes for Professionals



What are the optimum prerequisites for successfully implementing innovative ideas?

On the one hand, no doubt, it is practical experience, enriched with knowledge from tradition; on the other hand, it is adapting the product to the individual needs of the consumer. For the past eleven years, Ewald Haimerl has been fulfilling both terms of reference one hundred per cent in the professional manufacture of HAIX® functional shoes.

In his function as a master shoemaker and an active member of the volunteer firefighters in Mainburg, Germany, the managing director of HAIX® Schuhe Produktions- und Vertriebs GmbH brought with him both the know-how of craftsmanship as well as personal knowledge of the requirements demanded of a sturdy functional

At the time, no one dared to dream that this was the beginning of an unprecedented success story for the company, and that HAIX® shoes would travel around the world.

shoe. Haimerl's colleagues among the volunteer firefighters already recognized this potential at the beginning of the 1990s. "Make a decent fireman's boot!", the volunteer firemen kept pestering Ewald Haimerl. A business idea was born.

At the time, no one dared to dream that this was the beginning of an unprecedented success story for the company, and that HAIX® shoes would travel around the world. Be it the firefighters in the United States, the special task forces of the British police or the Bavarian police squadron – all of them trust only HAIX® to provide them with high-tech footwear.

HAIX® – four letters filled with tradition

In fact, the story of the HAIX® company originated five decades earlier: the name of the company founded in 1948, leader in the market for fire-fighting boots, goes back to Xaver Haimerl, the father of the present-day managing director Ewald Haimerl. In those days, the factory produced practically anything with soles. During the crisis in the shoe industry during the 1960s, the senior partner decided to switch to contract production. Thus, the company was able to continue business; the name HAIX®, however, completely vanished from

Ewald Haimerl began his training to become a shoemaker in his parents' business and four years later he proudly accepted his degree as a master craftsman.

the market. Until 1991, the company only produced for other shoe manufacturers. The year 1980, however, saw a crucial turn of events: Ewald Haimerl began his training to become a shoemaker in his parents' business and four years later he proudly accepted his degree as a master craftsman. Afterwards, he took over the production management in the family business.

By the way: that same year, Haimerl began his career as a volunteer firefighter in Mainburg, Germany. Later on, his favourite hobby not only stimulated the new business idea, but also ensured the company's further existence, because around 1990 a large part of the shoe factories relocated their production to the more cost-effective countries abroad. This had drastic consequences for HAIX®.

Focussing on the future – development against the trend

HAIX® has no need to fear the future. On the contrary: the company's order books both in Germany as well as abroad are full for the next five years. Apart from an annual ten per cent increase in turnover and an increase in its export turnover to 45 per cent, the company is aiming at expanding the US and UK markets. Furthermore, production capacities are expanded to 400,000 pairs of functional shoes. In order to meet these goals, new jobs are created and existing ones are secured. In economically turbulent times characterized rather by downsizing than by the creation of jobs, this factor contributes to the maintenance of Germany as a business location.

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Z 8 - The ZIEGLER Flagship on Course of Success

The crash fire rescue vehicle Z8 of ALBERT ZIEGLER GMBH & CO. KG, Giengen/Brenz, is continuing its history of success. Since the first vehicle of this category was supplied almost 25 years ago ZIEGLER is handling more projects than ever. Among others are: 16 units for the German Armed Forces, 5 units for Airport Zurich, 3 vehicles for Airport Vienna, 1 unit for Airport Zagreb, 8 units for Turkey.

With these orders Ziegler prove again that the leading suppliers of the German fire brigades also find high acceptance in

the tough international competition even in the king's class.

The Z 8 complies with and exceeds the ICAO-Recommendations.

As a basis for this crash rescue fire vehicle a MAN 8x8 chassis with single tires, MAN-V-12 Diesel engine with 735 kW (1.000 HP) is used. The vehicle with a total weight of 40.000 kg is suitable for interventions on offroad terrain and it stands out due to extreme high driving performance. Maximum speed is approx. 140 km/h; for acceleration to 80 km/h less

than 25 seconds are needed.

The Ziegler pump with a nominal output of 8000 l/min at 10 bar is driven by a separate pump engine with 338 kW (460 HP). At tank operation an output of 10.000 l/min at 8 bar is possible.

Further components are a water tank with of 12.500 l, a foam tank of up to 1.500 l/min.; on request a powder unit or a CO₂ unit can be mounted. Output of the extinguishing agent is either made through the roof turret (appr. 6.000 l/min.), or the bumper turret. Optionally a telescopic boom with nozzle and piercing unit is available which is designed for the NLAs coming into traffic now.

The vehicle superstructure consists of driver/crew cab, pump and equipment lockers and water-/foam tank. All components are mounted distortion-free on the chassis frame. Remarkable features of the superstructure in the patented ALPAS design are high flexural strength and torsion-proofness. Thanks to anodizing optimum protection against corrosion and a maximum degree of tightness and safety is reached.

The large canopy safety cabin manufactured in aluminium design provides a spacious working place with optimum view for 1+2 crew. Excellent features are protection against noise, heat and splinters and the strictly ergonomic arrangement of the control and monitoring elements.

Optional equipment: an automatic air conditioning system, heated seats cushioned pneumatically with integrated compressed-air breathing apparatus, heated outside mirrors as well as swinging doors operated pneumatically opening ahead with swivelling treads for safe and easy access, even with breathing equipment put on.

The Z 8 sets standards in the electronic features. Thanks to the cross-linkage of the electrical components by CAN-Bus all driving and control operations for the extinguishing technology can be brought together, evaluated and automatized. The various parameters of the extinguishing unit are shown in graphical displays. Thus, actual data are available for preparation, intervention, and for maintenance.

By these sophisticated features Ziegler provides a variety of advantages for the customer for being ready in case of emergency. Recently Stuttgart Airport has procured four vehicles of this design.

New Rosenbauer Panthers for Malaysia

The successful joint venture between Rosenbauer International and UMW Equipment in Malaysia has seen the emergence of a new project to manufacture/assemble the Rosenbauer Panther 6 x 6 in the UMW facility at Shah Alam in Malaysia's Selangor state.

These units will be operated by Malaysian Airports in domestic as well as the International airport KLIA and will go into service in 2007.

Built on Rosenbauer Motors CFR/6 x 6 chassis and powered by a Detroit Diesel, 441 KW 4-stroke diesel engine matched to a 6-speed, automatic Twin Disc TD61-1180 transmission, the superstructure will have a Rosenbauer aluminium structure, consisting of moulded aluminium tubular ribs with aluminium sheets, steel fenders, acrylic glass roof hatch.

Accommodation is provided for a crew of 4 and quick don BA seats are installed.

The 10,000 litre water tank is constructed in GRP and is integrated with the 1,200 litre foam tank.

Complimentary agent utilises a 450kg Dry Powder unit.

The fire fighting system consists of the Rosenbauer R600 normal pressure pump, driven by a Power Divider, and delivering 6000 litres per min, the pump is combined with the automatic Rosenbauer RVMA 500 Foamatic around the pump foam proportioning system



with induction rates that can be varied to 3, 6 or 8%.

The roof monitor is a Rosenbauer RM60E water/foam unit with electronic pistol grip remote control. With a an output of 5,000 l/min at 10 bar, the monitor can achieve a throw distance of 80 metres, and has the ability to operate at 50% output when required.

The bumper monitor is the Rosenbauer RM8E water/AFFF-monitor with electric remote joystick control. And can flow up to 1,000 l/min at 10 bar while giving a throw of 40 metres.

A single Rosenbauer hose reel with 30 metres of 38mm non collapsible hose is fitted in the lower locker compartment, and is fitted with a jet fog nozzle.

Also 7 under truck nozzles are provided for safe operation in close proximity to burn areas.

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9/11 Ground Zero Rescuer: Firefighter Vincent Forras

By Bob Lebensold

All but a few people on this planet know of the events of 9/11/01 when a group of terrorists, sponsored by Al Qaeda, hijacked several commercial jetliners and flew them into the twin towers of New York City's World Trade Center. All know that nearly three thousand people of all nationalities, including Arab Muslims, were killed outright.

Far fewer people realize that the firefighters and police officers – first responders – were seriously impacted as well. Many thousands of rescuers and associated personnel spent days, weeks and months in the toxic atmosphere, without regard for – or knowledge of – the risks they were taking with their own health.

In an ongoing follow-up study based at New York's Mt. Sinai Hospital, under the directorship of Dr. Stephen Levin, thousands of responders are being tracked for ongoing respiratory problems. Due to the exigencies of a city which is a hub of international financial activity, there was pressure to get back as close to normal operations as possible, as soon as possible. The United States Environmental Protection Agency (EPA) issued the all clear shortly after the event. The consequences of that action on the civilian population will not be known for years.

The Mt. Sinai study, however, is providing, and will continue to provide, valuable information about the effects on the rescuers. Predictions are grim. It is believed in some medical circles that the number of premature deaths and devastating health effects will exceed the number killed outright on 9/11, both mostly unofficially stated!

Rescuers working without the simplest of filter masks, much less the correct industrial protectors, breathed the air twenty-four hours a day, seven days a week, with little respite. Their dedication was such that they took breaks for food and sleep only when absolutely necessary, returning to work as soon as possible. When we say "breathed the air," it sounds almost normal. But consider the composition of that "air."

Consider the tens of thousands of computers that were pulverized into particles and carried in



suspension in the "air." Consider the fumes from the jet fuel and the industrial oil stored underground on the site. Consider the electrical transformers, almost certainly bearing PCB (polychlorinated biphenyl) oil which were destroyed releasing their carcinogens into the "air." Consider that PCBs under pressure and heat concentrate to become that most deadly group of chemicals: dioxins. Consider the glass and concrete, steel and cable, plastic, asbestos and all the rest that filled the air of Ground Zero on that day and in the weeks and months which followed. Now consider that the men and women who labored to save lives and, ultimately, clean up the site, breathed this air all the while...

Vincent Forras was one such rescuer. A firefighter in the upstate community of South Salem who responded to the call for assistance, worked tirelessly along with the rest for twenty-three days, and is now one of the subjects of Dr. Levin's study. Forras calls the responders "the greatest team ever assembled." He, himself, was trapped beneath rubble for almost two hours some three days into his service on site.

His health continues to deteriorate, yet he continues to work. He suffers sleep apnea and nearly daily attacks when the only thing between him and the end is the vaporizer spray which is his constant companion.

It is under these conditions that Forras, with his wife Monica Carrera, established Gear Up Foundation. Its stated mission: To help those impacted by the events of 9/11 to cope and heal by engaging them as ambassadors of hope, goodwill, harmony and brotherhood; by providing fire fighting equipment, training and mentoring to firemen in the United States and developing countries and providing fire safety education to children.

Forras came to realize that developing countries have woefully inadequate means of fighting fires when they have any at all. [Typically, in those countries, when a fire burns the responders can only ensure that the people are safe and stand helplessly by until it burns itself out.] Must that be? No! is Gear Up's answer. Equipment that may be outdated in more advanced countries is gold in developing countries. An old pumper truck is a

godsend, as are used protective [parkas], boots and gloves.

Vinny and Monica understand that rescuers are dying every day without recognition. Some don't even realize they are victims of 9/11. Gear Up is working to make sure the names and service of those who will continue to die anonymously are not forgotten.

In Gear Up's Healing the Heroes program, firefighters are given the opportunity to participate by sharing their time and experience with those in need. Helping others was instrumental in helping Forras cope. He realized that this work is a living memorial because the foundation has dedicated its efforts to the 9/11 victims and their families. "What better tribute can we offer those who perished, and their loved ones, than to do great deeds in their name?" asks Forras.

On January 23, 2006, Gear Up's First Annual Gala was held at the Tavern on the Green restaurant in Central Park. Among the dignitaries present were three members of the U.S. Congress, fire, police and medical personnel, including Dr. Levin. Forras was asked to comment on various aspects of the foundation.

"Considering the groups and people who came together tonight, and the hope and love that permeated the room, we are most definitely on the right track. The support in the way of trucks and equipment promised was incredible. I am confident that our mission hit a special chord in many people's hearts and I believe that it will translate into growing support at many levels in the coming months and years. It is my hope that corporate and philanthropic support will be sparked by word of mouth because of this event.

"We have great hopes and plans for this year and beyond. We have been invited to go to Brazil to partner with them as we have done in other countries. Just last Christmas over 250 youngsters lost their lives in a disco fire in Argentina. We are trying to establish a new fire station in Buenos Aires to help avert such tragedies in the future. We will continue to encourage firefighters, rescuers and others affected by 9/11 to join us in our mission of hope and love around the world. We believe that by helping others we can help ourselves. We will encourage corporate and

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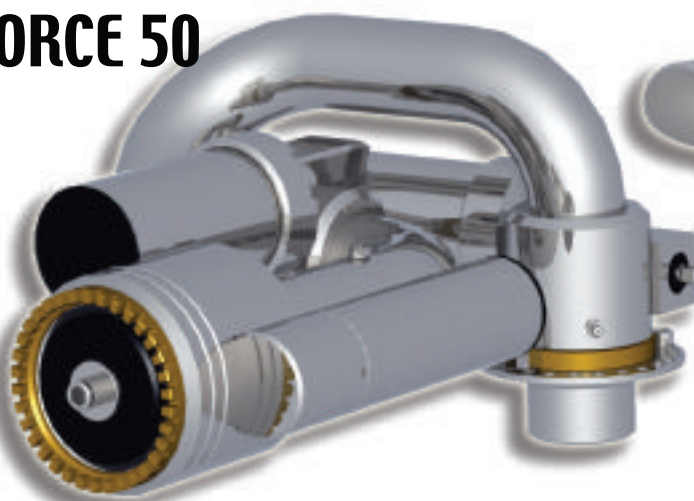
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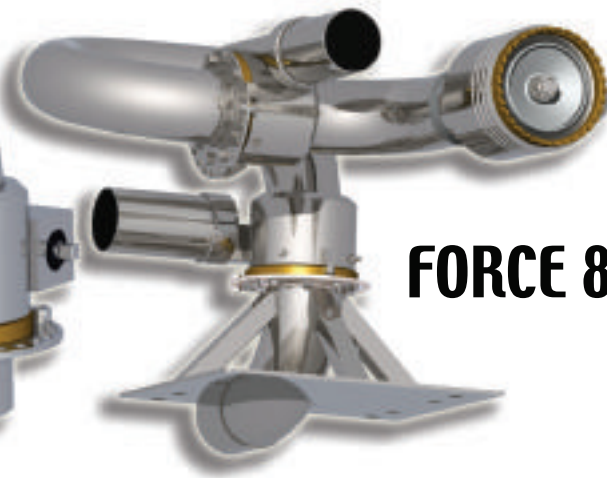


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My name is Mark Millington; I have been a firefighter for 17 years now with Nottinghamshire Fire and Rescue Service, with the last 13 years as whole time at Ashfield Fire Station.

My story involving Gear Up Foundation begins with the kindness of a few special people, one of these being Sir Richard Branson who flew me over to New York for the very first ceremony of 9/11. It was at this event in September 2002 when I was introduced to a FDNY Fire Department Chief and 9/11 rescue worker Mr Tom Harrigan. Tom and I became very close friends via the internet and he pointed me in the way of the Foundation and asked if I could help out in any way.

The charities aim is to help equip fire stations in the developing world with equipment and resources donated by fire services from all over the world.

The story continues with a meeting at Headquarters with Deputy Chief Fire Officer Mr Martyn Emberson, who gave me his backing for fire clothing and equipment which was either out of date or to be thrown to be saved for the Foundation. With the help of the stores and DHL we set up shipping to the Philippines where the Foundation is helping out fire personnel who are less equipped than us.

Once the gear had been shipped, this gave me the opportunity to meet a remarkable person who founded the Gear Up Foundation along with his wife, Mr Vincent Forras. After the meeting I vowed to 'Vinny' that I would help as much as I could. This is still ongoing and the mission is close to my heart.

My role has been to co-ordinate with the Charities Founder Mr Vincent Forras – who had worked in the aftermath of Ground Zero. So far we have been responsible for donating old uniforms, fire

equipment and resources to the Philippines, where the Fire Service is badly under prepared to tackle blazes. We see this work as a living memorial to those who perished in 9/11.

In September 2005 we were invited by the Philippine Mayor out to Lapu-Lapu city in the Philippines for a 9/11 ceremony, it was amazing to see all the gear/equipment we shipped over being used. The equipment and gear is appreciated beyond belief because of the non-resources that the Lapu-Lapu Fire Department have had to endure. The foundation set up a training programme for the firefighters and now they can enter a building and fight fires from the inside. An article was sent to me just before Christmas which showed firefighters in the city saving two young children from a house fire, which would not have been possible before the equipment had been sent as entering buildings was near impossible. This goes to show how much good can be done if we want to help out our fellow (brothers) firefighters.

This is just one story of many, in which Gear Up Foundation is working hard in other counties as well as the Philippines. After my trip to this small island, working along side Vinny, Tom and the rest of the Organisation has proved to me how much we can help and how much there is still to do. . . .

What would I like to achieve from this article now?

I would like all the Chief Fire Officers and their Deputies to donate all the gear and equipment that is going to be destroyed to the Gear Up Foundation's cause, you can check out what's happening at www.gearupfoundation.org or contact myself Mark Millington at Ashfield Fire Station 01623 440044.

Please take a look at the website and be involved with helping out our brothers in need.

philanthropic sponsors to join our mission, and we will build partnerships with organizations such as VOICES of September 11th so that together we can memorialize those whom we lost.

"Our mission was born in the ashes of Ground Zero. I believe that meeting my wife, Monica Carrera, was no accident but was divinely guided. It helped me to heal and to help others heal; to save lives and to make a difference.

"As a volunteer firefighter to have been so accepted by my brothers and sisters at Ground Zero and to be honored by their presence this night was truly living a fairytale. To be amongst families who lost so much and yet still care enough to try and help others is truly a miracle.

"We can do much more together than as individuals. That is our mission. to bring people and hearts together, helping others, saving lives and bringing smiles and life to the children we touch every day. I believe that, given the chance, goodness and love truly conquer all. What better way to honor the memory of our lost loved ones than to continue to do great deeds in their name?

"I pray that those who join us do so in a spirit of keeping memories alive and saving lives through actions, not words. Our foundation is one of action from the heart. I promise that I will not let you down. I will give my last breath to honor the memory and life of all who perished. **IFF**



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The jet style helmet provides additional protection to the head and neck



Keeping ahead with modern fire helmet technology

By Bob Gaskell

Fire fighting helmets have come a long way since the days when they were made from a combination of cork, vulcanised rubber and cotton twill bonded with resins.

In the 1930's the first cork helmets were introduced to replace the impressive looking, but increasingly impracticable helmets manufactured from brass. The use of layers of cork sheet cut and glued together was the same manufacturing process as that used for many years when making the tropical 'topee' helmet.

The use of cork gave the benefits of good shock and thermal protection combined with lighter weight and reasonable comfort to the wearer. This then established the distinctive style of helmet with a brim and comb that became the standard for use in many countries worldwide.

Traditional hand crafting of cork from flat sheet was superseded by the development of a quicker moulding process using 'granules' of cork bonded with resin. This in turn led to the introduction of glass fibre reinforced resin moulding during the 1980s.

With the possible exception of the self-contained compressed air breathing apparatus, quite correctly described as life support equipment, the fire helmet is probably the most important item of personal protective equipment worn by the firefighter.

Generally having to be worn in arduous and hazardous conditions, there are two main criteria that establish the suitability of the modern fire helmet – comfort and fit, and the level of protection provided to the wearer.

The use of modern materials such as thermoplastics, composites and resin impregnated glass fibre, has enabled the helmet to be both lightweight, and extremely strong.

Comfort and adjustability is crucial

It is however, a key requirement that the helmet should be adjustable for both fit and comfort, and

Helmet used with hand held thermal imaging camera



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importantly for this adjustment to enable an effective interface with a breathing apparatus facemask. The helmet therefore will usually achieve this by means of an adjustable headband, forward and backward location, height adjustment capability, and a multi position brow guard angle.

To provide protection for the face and head against a wide range of hazards such as, impact penetration and shock, fire, radiant heat, chemicals, and electrocution, and to do so in varying climatic and operational conditions, places great demands on the helmet, and consequently on the design and construction process leading up to approval testing, certification, and introduction into service.

The current British/European Standard BS EN 443:1997, is an internationally accepted approval standard for fire helmets, that includes an extensive series of tests covering, field of vision, shock absorption, resistance to sharp objects, flame resistance, radiant heat resistance, electrical properties, and retention system strength, with additional optional wet helmet and surface insulation tests.

Prior to testing the helmet is subjected to pre-conditioning which can include procedures such as UV ageing, solvent conditioning, and thermal plus or minus conditioning, depending upon the specific test to be carried out.

A separate standard and testing procedure applies to the helmet faceshield, the current standard being British/European Standard BS EN166: 2001, which has superseded BS EN166: 1995

It is a requirement that the faceshield is marked to indicate the manufacturer, the model number, the optical class, the level of energy impact protection, and if the faceshield is approved to the optional resistance to molten metal and hot solids test. A typical marking on the faceshield would read: *HISL F600 2 A 9*, being manufacturer, model, class 2 optical, high energy impact, and resistant to molten metal and hot solids

Consequently the development of the modern fire helmet has arisen from the drive towards more rigorous standards of protection, and this combined with the need to improve wearer comfort and reduce through life costs, has accelerated the introduction of fire and rescue helmets that will meet these requirements.

It is these performance criteria, considered in the light of changing operational demands that are continuously assessed and updated by the approval authorities, and the fire and rescue services, in consultation with the manufacturers. There is in fact a review of EN443 currently being undertaken, established as prEN443, which establishes a more demanding radiant heat test, both in terms of intensity and time exposure, increased resistance to penetration, and shock absorption.

Jet style benefits

A major recent development was the change in helmet shape from the traditional wide brimmed style with central comb, which offered little impact and thermal protection to the side of the face and neck, to the 'jet style' helmet which takes its name from the similarity of shape to those worn by military aircrew

The Cromwell F600 firefighter's helmet was one of the first helmets to be introduced with this styling, which also included an integral retractable faceshield. This design of helmet is now used in

most European countries and is becoming more widely used in other parts of the world.

The construction of modern fire helmets provide the added benefits of easily replaced individual components, thereby reducing maintenance, improving hygiene and increasing service life with an associated reduction in lifetime ownership costs.

Dual shell helmets increase operational capability

It is now generally accepted that less than a third of all 'call outs' to the Fire and Rescue Services require the need for a full structural fire fighting helmet. Other incidents not requiring this type of helmet include road traffic accidents, woodland fire fighting, water rescue, urban search and rescue, and industrial incidents such as confined space rescue operations.

To meet these requirements fire and rescue helmets have now been developed that offer dual a helmet system featuring two separate shells that can be integrated into one helmet.

The base helmet, would be approved for emergency and rescue operations not requiring a structural fire-fighting helmet, and therefore can also be used by for example, paramedic, water rescue and civil defence personnel.

This type of rescue helmet will typically be fitted with an internal goggle and connections for options such as ear defenders. In addition, these helmets can be configured for specialised operations such as heli-deck, coastguard, air sea rescue and public security.

When a helmet is required for structural fire fighting, an outer shell with an integral full-face shield fits onto the base helmet, providing additional heat, flame and impact protection to the wearer

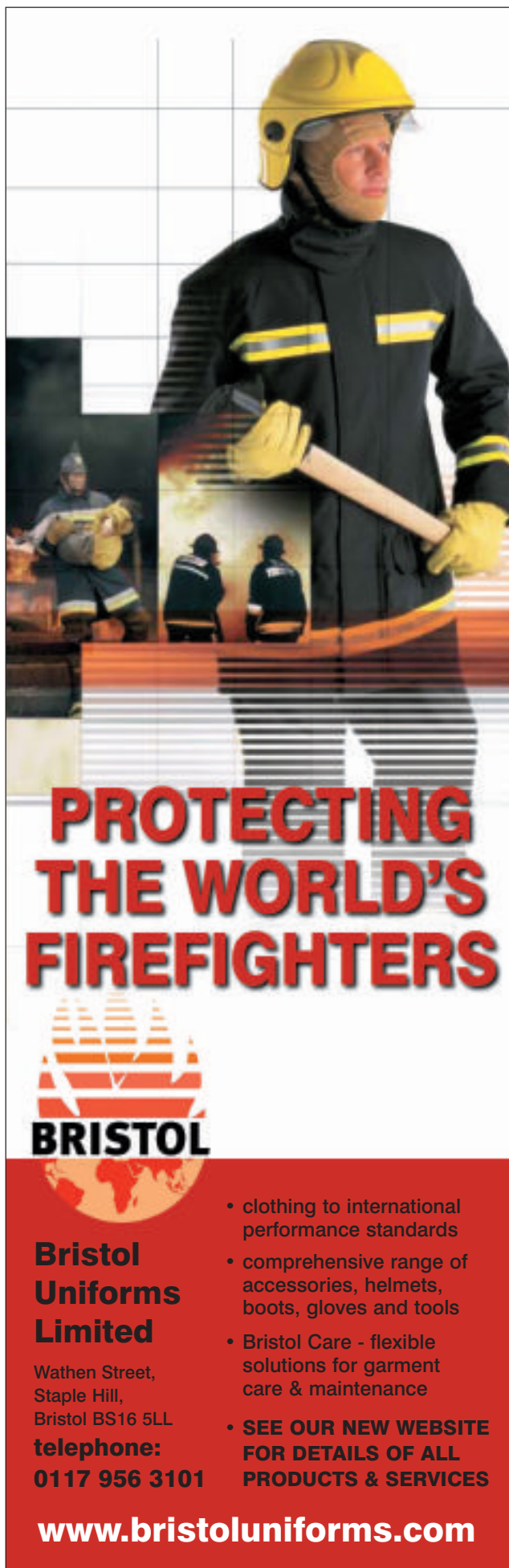
A major factor in the design of the latest fire helmets has been the requirement to reference published international anthropometrical data relating to both male and female fire fighters, and rescue personnel, across a range of ethnic groups, thereby ensuring that the helmet will be suitable for international use.

In recent years it has been an increasing requirement that radio communications can be fitted to the fire helmet, and this generally consists of a low profile bone-conducting microphone positioned on the crown of the wearer's head, the bone conductive microphone ensures the optimum clarity of communications, particularly when SCBA is being worn. The microphone then connects to a press to talk (PTT) switch and down-lead assembly, which is configurable to the radio in use.


Looking to the future

The technology already exists as individual instruments or telemetry, to provide features such as thermal imaging, physiological monitoring, localised temperature measurement, explosive atmospheres, and personnel location. Much of this technology could be integrated into the future fire helmet, currently however there would be a significant offset in respect of weight, bulk, and the unit cost of a helmet and the wider issues of certification.

However the extent to which aircrew helmets have developed in recent years is an indicator of the way in which the future fire helmet could



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Modern dual-shell fire and rescue helmet



develop. In the same way that the pilot's helmet has moved on from being a head and face protector, with the means of attaching an oxygen supply

and communication system, the fire helmet could become the carrier for a range of sensors and operational devices

The aircrew helmets for new aircraft such as the Eurofighter 'Typhoon', F35 Joint Strike Fighter, and Saab 'Viggen', now incorporate binocular helmet mounted displays that project the key flight control information, and weapons aiming symbology onto the helmet visor, making this available to the pilot wherever he looks.

The aircraft weapons fire and control systems are now also integrated into the pilot's helmet, enabling target acquisition, cueing and firing at multiple targets to be linked to what the pilots 'sees', after which the onboard computer takes over.

For all of that technology to work, the fit stability and comfort of the helmet unit itself is crucial, consequently in the case of pilots flying these new aircraft, individual computerised head scanning is carried out, enabling the internal liner of the helmet to be individually moulded to the pilot's head shape and size.

The extent to which personal sizing and technology integration would become practicable for all fire helmets remains to be seen, but it is probable that special operations teams will need to use such helmets in the future. The writer of a similar article in 10 years time might well report much greater changes than have taken place in the past 100 years.

Assessing fire fighting gloves

By Malcolm Hannon

Hands are a very important part of our anatomy and most of us would consider them vital for virtually every activity that we are involved with.

However, the most numerous complaints from fire-fighters has always been about hand protection, i.e. Fire-Fighting Gloves. – The most common complaints are that gloves are not dexterous enough, i.e. too bulky or too stiff, to



carry out the numerous activities a modern day fire-fighter encounters. – The majority of hand injuries are caused by fire-fighters removing their gloves in order to carry on with their duties, so why are gloves issued in the first place?

The answer is of course, we are trying to protect our fire-fighters from the various hazards they often come into contact with – heat, flames, compression burns, cuts puncture injuries, chemicals and viral infections and the many other risks and hazards that they face carrying out their normal duties. – Most brigades in the UK accept that one type of glove will not do. The risks faced by the fire-fighter at buildings or other close proximity fires are different than those faced at road traffic incidents and other types of technical rescues. – There are a number of good glove manufactures throughout the world and especially here in the UK, we have fire glove manufacturers who produce a quality product, but do the gloves protect the hands of the fire-fighter? They sure do, but having discussed this item of clothing with many fire-fighters, the glove more than any other part of their PPE ensemble, is the one thing that promotes

Non-structural glove

the most discussion. – With the introduction of EN standards for PPE and in particular the EN659 for fire-fighting gloves, we have supporting evidence from fire brigades who wear the correct protective glove, hand injuries have been reduced by up to 40%. – It is estimated that the annual world-wide market for protective gloves is in excess of 90 million pairs, with an estimated retail value of 10 billion. – On a pairage basis the disposable medical sector is by far the largest user accounting for approximately 85% of gloves used. However, on a value basis, because of their relatively low unit cost, the medical gloves share of the market drops considerably. – In contrast, low volume products which are as complicated to manufacture as the fire-fighters gloves, command significantly higher prices in the market place, enabling many niche manufacturers to survive.

One of those is based in the west country and have the added benefit of being one of the very few glove manufacturers in the UK with their own leather finishing plant, which enables them to resource and develop highly tactile and technical leather finishes, which they consider is the main requirement of a fire-fighting glove. – The first and most important part of a good quality fire-fighting glove has to be the material used in the outer shell construction.

European fire brigades tend to favour synthetic aramid fabrics, i.e. Twaron Kevlar, Carbon Fibre fabrics, Nomex, in the UK, leather is still predominantly used by the majority of fire brigades. – A good quality grain leather, preferably cowhide, will offer the wearer excellent protection against



The Ultra glove

chemicals, water, flames and heat, this is due to the treatment you can apply to grain leather, plus the longevity leather has, means that in a short space of time the wearer will enjoy a comfortable fit due to the relaxation in the leather, for a very long time to come. – The majority of the fire gloves incorporate a dual lining, i.e. material lining/moisture proof membrane, most aramid fabrics will perform to the EN659 standard requirements, however, it is important to incorporate a lining that not only meets the requirement of EN388, i.e. tear/cut/puncture/abrasion, but a lining material that exceeds the minimum requirement, giving the wearer the added comfort of knowing his hand is not vulnerable to any sharp objects the fire-fighter may encounter in a

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fire/training incident. – Although it is still not a requirement of the EN659 standard even in the revised edition published in 2003, a waterproof membrane is an essential part of the integral make-up of the glove, quality moisture barriers are tested to ensure it is liquid, blood, body fluid and common chemical liquid penetration resistant. – What typically helps in heat protection detracts from wearer comfort, particularly in such a small area as the hands.

The thicker the lining, the reduction in breathability and the dexterity is impaired, therefore it is essential in the design and manufacture of the glove, to make the complete assembly as light and dextrous as possible, whilst maintaining the highest level of protection. – –

Modern glove designs can now incorporate unique silicone coated Kevlar re-enforcement areas on the fingers, with a roll-top design to offer dexterity at the finger tips, this can be extended across the palm area and into the crotch of the thumb, to give extended wear on the parts of the glove that tend to take the brunt of wear, particularly if the fire glove is used as a dual purpose glove, i.e. debris clearing as well as fighting fires. – In purchasing the correct PPE the buying mentality has been 'value for money' as most brigades are under budget restrictions, buying the cheapest piece of kit can significantly be more expensive if the product does not perform. – Fire fighting gloves are the most disposable item of kit, reasonable gloves can be expected to last 4 to 5 months under normal incident/training conditions, however, evaluations with brigades with a quality leather glove have proved a glove can last up to 18 months, particularly if the wearer has worn them for the correct fire fighting procedures. – There is a major challenge on the horizon for manufacturers with the introduction of the National Procurement Strategy. – Firebuy, incorporating the Integrated Clothing Project, will be set up to contract with successful bidders, (not necessarily manufacturers), for a period of 15 years complete. – At the end of this 15 year monopoly, which existing specialist PPE manufacturers, will still be in business to put forward new designs and equipment for the next contract.

Unfortunately, the answer may well be none.

Fire boots By Barrie Lucke

The new European Standard for firefighters footwear, currently known as prEN 15090 is now in the final stages prior to publication. This prEN has been prepared by Technical Committee CEN/TC 161 – no fewer than 18 countries were involved. The varying requirements and conditions within these countries have led to a situation whereby the supply and purchase of fire boots is going to be more complicated than currently is the case.

It has taken nearly 25 years of work, between footwear manufacturers, the fire brigades and the standards authorities, to create the type of product currently available for our firefighters in the UK.

The leather fire boots worn by brigades in the 1980's were made to BS1870. This was the same standard used for the manufacture of all safety footwear – whether working on a construction site, a shipbuilding yard, or any heavy industry. At that time there was no perception of the different hazards and risks which might be found fighting fires as in general heavy or medium industry.

In 1993, national standards for safety footwear were replaced by European standards and therefore BS1870 was replaced by EN345 – the new European standard for safety footwear but it was soon realised after publication, that the basic safety footwear standard was not providing adequate protection in certain extreme conditions.

A simple add on standard was conceived, called EN345 Part 2. This catered for firefighters and chainsaw protection, plus other properties such as metatarsal and cut through protection, and water resistance. This came into force in 1997.

ADDITIONALLY, THE HOME OFFICE INSPECTORATE ADAPTED THE A29 SPECIFICATION FOR RUBBER BOOTS, TO INCLUDE SOME PROPERTIES WHICH WERE REQUIRED SPECIFICALLY FOR THE UK FIREFIGHTER. THE A30 SPECIFICATION WAS THEREFORE PRODUCED FOR THE LEATHER BOOT.

Work has been going on around Europe to produce a document to cater specifically for the needs of the firefighter.

It will be based on the requirements found in EN345 Part 2 but is strongly related to the EN ISO 20345 series of standards.

The purpose of the new standard is to provide minimum performance requirements for footwear for firefighters designed for use for fire fighting and associated activities. These requirements are split into three main areas.

- 1 The materials from which the footwear is manufactured should not melt or ignite when exposed to flame and the footwear should be commensurate with the risks to which the firefighter may be exposed.
- 2 A risk assessment should be used to determine if the footwear covered by this standard is suitable for the intended use for the expected exposure.
- 3 Firefighters should be trained in the use, care and maintenance of the footwear covered by this standard, including an understanding of its limitations.

One of the biggest changes is the introduction of 3 types of footwear, so as to offer a wider selection of protection for different environments. These types will be known as Type 1, Type 2 and Type 3.

A risk assessment will have to be carried out by the brigade and then to assist in the determination of the type of footwear that matches the risk assessment the following guide is provided:

- **Type 1** – Suitable for general purpose rescue firefighting suppression action involving a fire in vegetative fuels such as forest, crops, plantations, grass or farmland.
Unusually, in Type 1 footwear steel toecaps and midsoles are not mandatory, and it should be light, flexible and not too hot.
- **Type 2** – Suitable for fire rescue, fire suppression, and property conservation in buildings, enclosed structures, vehicles, vessels, or like properties that are involved in a fire or emergency situation.
- **Type 3** – Hazardous materials emergencies, involving the release or potential release of hazardous chemicals into the environment that can cause loss of life, personal injury, or damage to property and the environment. Suitable also for fire rescue, fire suppression, and property conservation in aircraft, buildings, enclosed structures, vehicles, vessels, or like properties that are involved in a fire or emergency situation.

Rubber boots are the only type which would fulfil these requirements.

Under **prEN 15090** the following properties have been added and changed from being an option in the old standard, to being mandatory in the new standard.

- 1 Slip resistance of the outsole.
- 2 Energy absorption of the seat region (shock absorption for the heel).
- 3 Flame resistance for all exposed components.
- 4 Penetration resistance of the sole.
- 5 Corrosion resistance of the steel toecap.
- 6 Either anti-static or electrically insulating outsoles are acceptable.

This final point about anti-static or electrical insulation will require the fire brigades to make a decision. The Home Office recommendation A29 and A30 for rubber and leather fire boots respectively, requires that the footwear passes the electrical insulation test. This helps to protect the firefighter in the event that he or she comes into contact with live electrical cables or equipment which could provide a fatal shock.

If anti-static footwear is used, the A29 and A30 regulations would have to be disregarded and the fire brigades would have to decide whether they prefer the firefighter to be protected against the static build-up in the body versus protection against electric shocks from an external source.

Risk assessment is going to become an important part of the selection process for the type of fire boots required. The three major steps of the risk assessment process are Risk Identification, Risk Evaluation, and Risk Control.

In recommending factors for identifying and evaluating firefighter risks, some of the following points should be considered:

- 1 Level of firefighter training and experience.
- 2 Level of fitness and health of the firefighter.
- 3 Function of the firefighter at the incident scene.
- 4 Environmental conditions at the incident scene.
- 5 Specific hazards to be faced at the incident scene.
- 6 Known limitations of footwear for firefighters and other PPE.
- 7 Appropriate fit of footwear for firefighters.
- 8 Type and application of command system at the incident scene.

Criteria have also been laid down for assessment to be made of the state of firefighter's footwear during wear.

Pictorial diagrams are now available depicting various problem areas in footwear and what to look for.

One key point is that when the cleat depth reduces below 1.5mm – the footwear should be replaced. Slip resistance is a very important quality in all safety footwear and as the sole pattern wears away, the risk of slipping increases. In all instances, common sense should be the key. For example, if the boots have been subjected to excessive wear in heath fires or hayrick fires, the footwear should always be examined after use.

Although as much protection should be built into the boots as possible for the firefighter, they must also be made so they are comfortable for the wearer.

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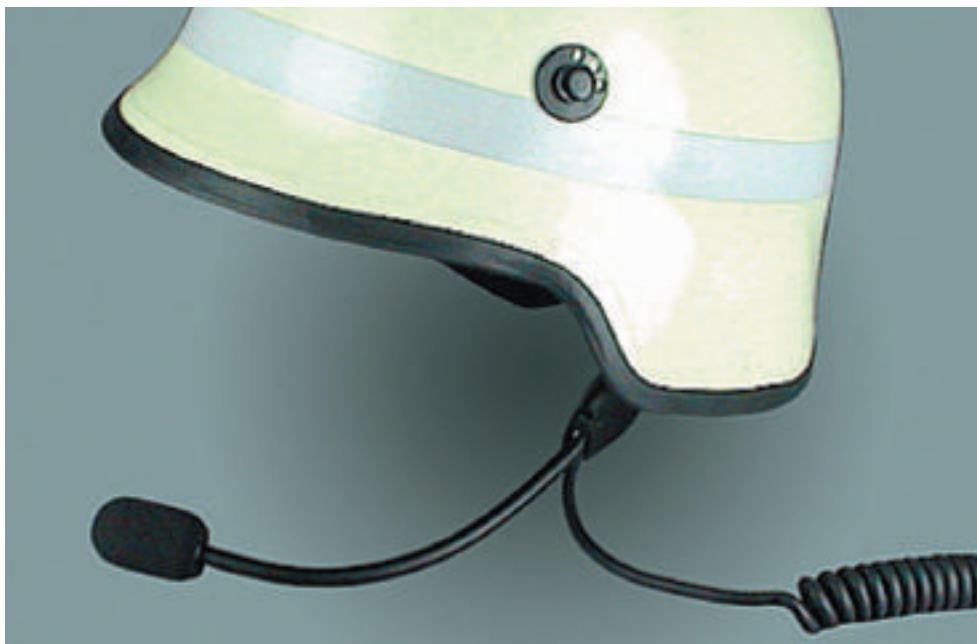


Low Sense Mode: Widest temprange



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Pic courtesy of Savox Communications



Helmet communication systems taking a more central role within PPE

By Christoffer Segercrantz

In today's world everybody is communicating easily from one continent to another. Making sure that important information is communicated to the right person in time and safely is important for all of us.

You may ask; why can't this be done in all situations?! This is a question that is often asked by professionals working in demanding conditions.

Complete fire fighting helmet communication systems consist out of three different components the helmet, the headset and PTT and the Radio (terminal). To start with you need a radio, then a communication system with the right interface to the radio and finally the helmet.

Almost all fire fighter helmet manufacturers design their helmets in a way that communication systems can be fitted after words into the helmets. Some manufacturers work very close together with audio accessories manufacturers to optimise the integration of different audio accessories and

to make the combination safe for the user. This will in the future be of great importance because all accessories that are attached to the helmet should comply with the helmet standard.

When talking about the radios (terminals) there are several hundred of radio interfaces for the analogue radios and less than ten for the digital terminals (Tetra and Tetrpol). The matrix for all these different combinations is a challenge to manage.

When buying helmet communication equipment one should make sure that the supplier has knowledge about the rest of the equipment and that the combination works and that there are proper connectors and adaptation systems.

Normally a helmet is the sign for people working and operating in extreme and hazardous

Pic courtesy of Savox Communications



conditions. This is always the case when a fire fighter is on a call. To make sure that the personal safety of the fire fighter is ensured, different communication systems are used. Helmet communication systems are getting more and more popular within the field of fire fighting. Today's fire fighting helmets are designed in a way that different communication systems can easily be fitted in to the helmets. You can choose from various versions of helmet communication accessories (headsets) depending on the type of work and the type of helmet that is in use. The headsets shall provide instant, clear and reliable communication, increase personal safety and work efficiency and allow full concentration on the task. The headsets shall be durable, lightweight, ergonomic and easy to mount to the helmet.



Pic courtesy of Savox Communications

One very common way of ensuring clear and reliable communication is to use a bone conduction microphone system. The bone conduction microphone system picks up the speech from the vibrations of the skull without picking up surrounding noise. There are two evident and important issues when using a bone conduction microphone system:

- First it must be easy to wear even for several hours without a "hot spot" on your head.
- Secondly, you need loud and clear sound.

The bone conduction microphone can be positioned almost anywhere as long as it is in direct mechanical contact with the skull. Thick hair and a flash hood don't affect the function of a properly placed microphone. However the strap of a breathing apparatus facemask should not be in-between bone conduction microphone and the skull. The head, flash hood, and the microphone or it may cause the vibration to be weak. To secure the best performance from the unit, it shall be in the right position tightly fastened. A loose unit causes noise and a muffled, weak sound.

When correctly positioned and installed in the helmet the performance of the system is one of the best helmet communication systems. The bone condition type of communication system is very common when using breathing protection.

Other popular systems that are used in combination with fire fighting helmets are; Systems with electric microphones that pick up the signal from normal speech.

Various versions of electric type of headsets are used. Some of the most popular are gooseneck versions and compact integrated versions. Compared to the bone conduction microphone systems, these systems are easier to mount due to the fact that there isn't any need of a mechanical contact to the skull. The positioning of the unit depends on the microphone characteristics, how sensitive it is. Different types of noise cancelling microphones are used to increase the performance of these electric microphone headsets.

Using this type of systems is not always the best solution for very noisy environments.

What is new on the fire fighting helmet communication side?

Hearing protection with integrated communication in combination with a fire fighter helmet. Noisy environments where the noise level exceeds 85 dB like airports, helicopter decks and vessel machine rooms are environments where this type of systems should be used. As many of these environments are intrinsically safe environments and that is why even the aspect of ATEX classified and approved products are to be used. It is important to protect the fire fighter from noise injuries and at the same time secure the communication. Both bone conduction microphone and electric boom microphones are used depending on the environment.

Why are there no wireless helmet communication headsets?

The issue of wireless headsets for fire fighters has been one of the main discussion points for some time. Having a wireless headset without any cables has been a dream for many of these extreme users for a long time.

The technology available on the market has not been feasible for this type of equipment used in

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extreme and hazardous conditions. In the last few years the breakthrough on the wireless markets has been very broad. The number of wireless mobile phone headsets users is in the 100Million range. This fact has really driven down wireless chipset prices.

Having a wireless headset in a fire fighter helmet is not just based upon a wireless module but it needs a power supply as well. Power source technology is today one of the main focus points of the wireless industry. For users in extreme conditions the fact that many of the existing power supply sources have issues with high temperatures and especially explosion risks are a main concern. Having a power source inside your helmet that might explode in high temperatures is a serious personal safety matter! Another issue with the current power source technologies are the fact that these need a very strong enclosure from both mechanical and heat stress. The strong enclosure requires space in the helmets that today are not designed to incorporate this type of enclosures and dimensions.

The power source industry is bound to bring to market new power source technologies that are suitable for these environments.

The two-way radios used today within the Public Safety authorities are not equipped with any

kind of wireless modules for headsets. This means that the wireless module must be integrated into an external device to the two-way radio. The most common place for such a wireless module is the Push-to-Talk unit. This means that the real wireless link is between the headset and the Push-To-Talk unit.

The technologies that are today available for this type of wireless modules are Bluetooth, Zigbee and WLAN. Still today there has not been any manufacturer stepping forward and leading the way.

What kind of PTT solutions are available

One important part of the helmet communication system is the PTT unit. There are two types of PTT units, the traditional one, just push and talk and version with both PTT and integrated speaker and microphone.

The most popular type of these PTT units is the ones with a separate rugged quick release connector for the headset. Hard-wired option is for more cost efficient solutions were the need of disconnecting the headset is not needed.

The version with both PTT and integrated speaker and microphone is in it self already a communication device. This type of a PTT gives the fire fighter the freedom of removing the helmet and disconnecting the helmet communication system without losing the possibility to communicate.

All PTT units must be easy to operate and at the same time it should be protected from unintentional transmission. Unintentional transmission is a big safety risk within fire fighting. This can only be achieved by the right design of the PTT unit. The PTT units are in general always exposed and are on the outside, headsets are then again in general inside the helmet protected from heat, cold, water and fire. The PTT units, the connector cables and the connectors have to be of high quality and also very robust to withstand all the mechanical stress that they are exposed to. The units and especially the connector between the headset and the PTT units should be robust, easy to handle with fire fighting gloves and easy to clean in the field in case of dirt coming on or into the connector. The connector of the PTT that connects to the radio is as well important to keep clean from dirt and dust to make sure that the system works 100%

New radio technology is moving in

Especially Europe is going through a change moving from trucked analogue systems to digital networks (Tetra or Tetrapol). The rest of the world is following and the trend will continue. The FES (fire and emergency services) sector are taking more and more this technology in use moving away from the analogue technology. The digital technology opens up new possibilities. Intelligent accessories will in the future be more common and a lot of information that has been communicated through speech will be automatically sent through with pre-programmed commands. This will have a positive impact on the personal safety once the fire fighter can concentrate more on the task then on communicating with the outside world. Although the accessories are getting more advanced the accessories can never improve the performance of the radio (terminal), only make the operation more suitable to the surroundings and safer.

IFF

Pic courtesy of Savox Communications



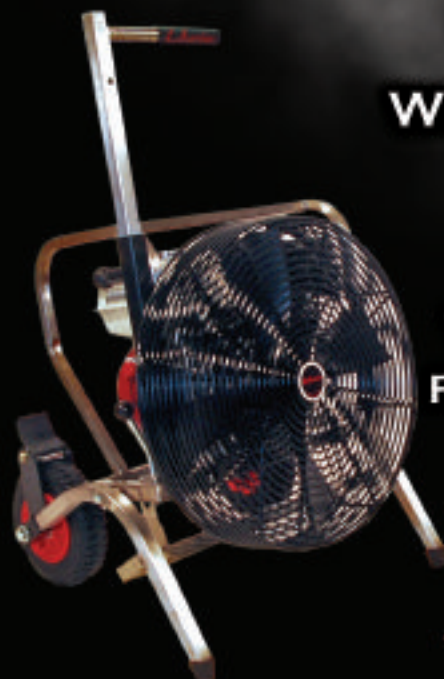
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Safety Lighting for Firefighters

A Review of Technological Improvements

By Alex Jackson

This paper reviews changes in legislation and technology related to torches and lighting used by firefighters in potentially explosive atmospheres.

Potentially Explosive Atmospheres

Confined spaces and 'EX' hazardous areas are locations where explosion hazards, caused by potentially explosive gas, vapour, mist or dust atmospheres, can be commonly found.

Such atmospheres are present in many industries and sectors, including the petrochemical, offshore, aviation, pharmaceutical and food industries, in the gas and water utilities and in waste disposal, agriculture and power generation; and are most likely to occur in areas where flammable materials are stored, generated or used in manufacturing, and in enclosed or partially enclosed spaces, such as process vessels, storage tanks, culverts, sewers, tunnels and shafts, including areas within underground railway and road systems.

Fire Services throughout the World use safety lighting equipment in such conditions to eliminate the risk of fire or explosion, resulting in injury or

death. Different equipment certification schemes or legislative requirements are in force in different areas around the Globe. Only 'ATEX' certified equipment may be used in potentially explosive atmospheres within the European Union. ATEX has now set the standard that the rest of the World is starting to follow.

Why ATEX Lighting?

Tasks carried out in hazardous areas and confined spaces will often be in reduced visibility or darkness; lighting can become critical to any activity in these conditions. When such areas must be accessed, for inspection, maintenance or rescue, portable or temporary lighting must be used. Risk of explosion or fire from ignition of the atmosphere means that any electrical equipment used must be safe in such dangerous environments. Within the EU there are now legislative requirements upon employers to ensure appropriate

Light source colour temperature; halogen on the right with a 'cool' white beam, LED on the left with a 'cooler' higher colour temperature beam



electrical or mechanical 'ATEX' compliant equipment is used in potentially explosive atmospheres

ATEX Lighting Selection

A wide variety of "ATEX" explosion-protected lighting is available. To ensure safe use, the correct selection criteria are critical:

- Characteristics of the explosive atmosphere, denoted by the certification code (temperature class, gas group, zone).
- Amount and type of light required for task.
- Task duration.
- Conditions (e.g. wet, harsh).

"Technical Bulletin 1/1997 Breathing Apparatus", issued by the UK Home Office Fire Service Inspectorate states that "BA is used in atmospheres that would be hazardous to health"; "the wearer may face risks from hazards in addition to the irrespirable atmosphere, such as from fire, explosion or collapse." It specifies that one "BA Lamp" should be provided for every set of BA; the characteristics of the lamp are described in Appendix 1, Chapter 2(c), focussing on the need for an appropriate certification for safe use in potentially explosive atmospheres. "Lamps for use with BA should be certified . . . for use in Zone 1 with Gas

group IIC and a minimum temperature requirement of T4". This minimum coding will ensure safe use in the majority of operational situations.

ATEX Portable Lighting – Technological Improvements – Light Sources

LED Light Technology

LED or Light Emitting Diode technology is the next generation light source for lighting in general, and for portable safety lighting in particular. The white LED was developed in 1996; from very limited initial application, LEDs have seen greater and greater use in portable lighting over the last 10 years. White LEDs were originally restricted to low power devices such as the widely used 5mm package. It was not until the development of the high-power 1-watt LED, six years ago, that a serious contender to the filament lamp emerged.

Fitted for life and zero maintenance

Incandescent lamps use a comparatively fragile tungsten filament light source, susceptible to fracture if subjected to impact from knocks or drops. LED technology offers far higher reliability from an inherently more robust construction with greater resistance to rough use. Furthermore, the 20-30 hour typical filament life of an incandescent torch bulb is insignificant when compared to the 25,000 plus hour life of an LED. LED light sources are 'fitted for life' and will more than last the life of a torch, requiring zero maintenance.

Greater efficiency, more lumens per watt

LEDs have always been marketed as offering greater efficiency than incandescent filament sources, more lumens per watt. Until recently this has been a difficult comparison to make because of significant differences in achievable light output levels. With the advent of the high power LED, the true comparison can be made. Currently the



Warning sign for places where explosive atmospheres may occur



LED Quality of light; on the left is a 'tight' beam with no fringe light, on the right is a 'tight' beam with a wide angle of fringe light, allowing visibility in the periphery

difference in efficiency between halogen incandescent torch bulbs and LEDs can be double (typically 12 lm/watt on low voltage halogen lamps compared with 24 lm/watt on high power LEDs), with the promise from LED manufacturers that efficiencies can and will increase in the near future.

Specific benefits for ATEX equipment

In addition to the benefits already outlined, LEDs offer real advantages for portable hazardous area equipment. They are a "cool" solid-state technology; they do not present the hazards of hot filaments in incandescent lamps, but lend themselves to higher levels of protection with the opportunity of use in Zone 0 equipment.

Quality of light

LEDs give an excellent, controlled light, considerably whiter with a higher colour temperature than halogen lamps. However with high power LEDs still in their infancy, there has been a lack of experience and knowledge in applying optics. "Off the shelf" solutions are available, generally developed for commercial lighting installations, but often not suited to torches. Portable lighting manufacturers are starting to develop products with bespoke LED optics, some offering very impressive solutions.

Good LED optical solutions can offer excellent beams without the shadows, rings and black holes often found using filament bulbs. Poor LED optics can result in low light levels, uneven beams or high intensity "tight" beams with no fringe light outside the beam. These can all give problems, but the latter can create real hazards in a critical situation where surrounding obstructions or obstacles are not visible; users have reported with such products that when pointing the beam straight ahead, nothing can be seen on the ground, above, or to the sides, "which is like walking with blinkers on".

Light output comparisons

Traditionally the light output from torches has been measured in "candlepower". This can give an indication of light intensity, but does not give the full picture, with no suggestion of how effective the beam is. A fuller picture is given when looking at the power of the light source in watts (generally the more watts the brighter, although different types of source can be more or less

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The advances in rechargeable battery control technology and the use of Li-Ion cells are starting to be applied to rechargeable ATEX torches



efficient), the lumens output from the light source will convey the amount of light generated by the bulb or LED, and finally the lux value for the torch or lamp will identify light intensity at a particular distance, typically 5 metres. Ultimately the recommendation is to take a number of different torches into a dark or smoke filled area and compare the light. This is the only way to get a true feel for how effective the beam spread and intensity is, in the actual conditions.

ATEX Portable Lighting Technology – Batteries

Primary cell power

Safety torches have traditionally used low power zinc cells; now with newer methods of assessment and changes in safety standards, ATEX torches using high power alkaline cells are becoming the norm. Alkaline cells typically have 3-4 times the capacity of zinc cells, giving the benefit of a higher power light output for a longer duration. Users must be beware though, safety torches now have restrictions, allowing only specified brands and types of cells to be used.

Consideration should be given to the number and size of primary cells required by a particular torch, and how long the cells will power the light source, as this will affect product “life-time cost”. Small sized primary cells can be less expensive than larger cells, but will have considerably less capacity; generally D sized cells offer the best value with the lowest price per “watt hour”.

Additional features are now becoming available with primary cell safety torches, such as spare bulbs and low battery warning indicators. Such features can attract a price premium, however

users should not forget the benefits. In addition to the added user safety from the low battery indicator, particularly in confined spaces where the risk of being ‘left in the dark’ is reduced, users are reporting environmental and financial benefits over previous practice, now cells are replaced only when they need to be.

Rechargeable battery power

In the past, rechargeable “Ex” equipment has been regarded as unreliable, users reporting bad experiences with devices such as rechargeable torches, radios and gas detectors. Reliability problems appear to have centred around nickel cadmium (NiCd) and nickel metal hydride (NiMH) battery chemistries, and have related to ‘battery memory’ and loss of capacity. Battery suppliers claim the problems relate more to control and use of the rechargeable batteries, rather than the batteries themselves.

Rechargeable battery technology has made many advances in recent years. As a result of consumer demands for an ever-increasing array of electronic devices to be made available with greater reliability, and without the inconvenience and expense of primary cells, rechargeable batteries and the associated charge and discharge control technology has improved immeasurably. Lithium Ion (Li-Ion) rechargeable battery chemistry has emerged over recent years as the battery technology of choice for high-end electronic equipment from cell phones to laptop computers. The key advantages of Li-Ion cells are a very high power density with a low weight, high cell voltage, environmentally friendly, low self-discharge, no memory effect and a fast charge rate. The advances in rechargeable battery control technology

and the use of Li-Ion cells are starting to be applied to rechargeable ATEX torches.

Features to consider with ATEX rechargeable torches

- 1 Intrinsic safety protection – for ATEX compliance.
- 2 Battery charge control. For long-term reliability of rechargeable systems, equipment should have full electronic charging control, cutting off charge but monitoring capacity once the battery is fully charged.
- 3 Low battery cut-off. Shuts the battery off when capacity gets too low; prevents battery damage and premature battery capacity loss and failure.
- 4 Low battery warning. Alerts the user to imminent battery cut off; warning can include switching output to low power and repeatedly flashing the beam off momentarily.
- 5 Battery power indication. Shows battery state of charge for both charging and discharging.
- 6 Dual power light output. Cuts down the light output for extended battery duration.
- 7 Quick charging. Particularly important for critical emergency applications.
- 8 Multi voltage charge input. Facility to power from a variety of voltages including 12V for smaller vehicles, 24V for fire trucks and 230V for mains charging.
- 9 Low and easy maintenance, including battery replacement.

Rechargeable versus Primary Cell technology

- The selection of one battery system over another comes down to a number of factors:
- Level of usage, high usage may justify higher cost rechargeable equipment.
- Budget
- Level of acceptable maintenance – primary cell equipment is higher maintenance.
- Level of equipment issue – generally primary cell torches are personal issue, rechargeable products are often for general usage, supplied for a task.

ATEX Portable Lighting Technology – Other factors to consider

Construction

- Is the product construction resilient enough to withstand anticipated usage?
- Are the enclosure materials resistant to any chemicals that may be encountered?
- Is the equipment suitable for the environmental conditions (dust/water tight)?

Ergonomics

- Is the equipment easy to hold and use, does it offer single-handed switching?
- Is the equipment sufficiently lightweight?
- Is the equipment capable of being used hands free?

'Life-time cost'

- Consider product "life-time cost" of primary cells versus the purchase cost of a rechargeable unit.
- Consider product "life-time cost" of a filament bulb torch, with replacement lamps and maintenance cost, versus the cost and performance of an LED unit.

- Consider the comparative levels of maintenance and ease of maintenance required for individual products.
- Some emergency service organisations now look at a "spend to save" policy, believing that spending more on better specification, better performance and lower maintenance equipment will give long term cost savings.

Conclusions

Many Fire Services throughout the World use safety lighting equipment in all situations to eliminate the risk of fire or explosion, resulting in injury or death, should an explosive atmosphere be present. Torch technology has changed dramatically in the recent years, safety torches are now available with greater light output and performance than ever before. It is critical that equipment is selected, used and maintained correctly to give safe and reliable operation.

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The Bangladesh clothing factory fire, February 2006

According to this month's Fire Safety & Technology Bulletin¹ 'at least 84' persons were killed in a fire at the clothing factory in Kalurghat, Bangladesh on 23rd February this year and there were hundreds of non-fatal injuries. From such very limited information as is at this stage available it is clear that inability of persons to evacuate was a major factor in the tragic consequences, gates and other exits having been locked at the time of the fire. Some of the deaths were due to attempts to escape by jumping out of windows. It is believed that about 1000 persons were inside the factory when the fire occurred. This commentary will examine possible factors leading to the appalling tragedy.

By J. C. Jones

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Although definitive information is not available a BBC report² has suggested that the fire began through an electrical fault. Possibly this was due to contact of two current-bearing conductors lacking proper insulation. The conductors were perhaps previously overloaded, that is, carrying a current in excess of that for which they are rated with resultant heating and destruction of the insulation. It might have been that although the conductors were bearing only the current for which they are rated they were buried in debris so that the 'rating' was invalidated, as it applies only to a cable which is able to lose heat by convection to the surrounding air. If the debris is itself combustible the situation is more dangerous still! That a cable having become over time covered with ignitable debris should have consequently overheated and provided an ignition source for the debris is an obvious possibility in a factory as untidy and disorderly as that at Kalurghat. The account in the Fire Safety & Technology Bulletin informs us that there were 'large quantities of chemical and stacks of yarn on the floor'. It is possible that these aided the initiation of the fire as well as its subsequent spread. These are ideas on the part of the present author – no more! – although it must be emphasised that restriction of heat loss from an electrical cable by its partial burial as described can unquestionably start a fire. There was a detailed theoretical analysis of this in the late 1980s.

It would be interesting to know what the fire load of the building was, that is, how much combustible material there was per unit area of floor space. The usual definition is of fire load is weight of material of calorific value in the range 16 to 19 MJ kg⁻¹ per unit area of floor space. If something with a calorific value outside this range is present its weight is for calculation purposes adjusted by simple scaling. Schools have fire loadings typically in

the 7-8 lb ft⁻² range, residential premises being about the same, whilst industrial premises may have 25 lb ft⁻² and storage premises 30 lb ft⁻². High-hazard premises are those whose business necessitates the presence of large quantities of materials with high calorific values, e.g., solvents, tyres, granular plastics and, quite possibly, possibly clothing materials. Special fire safety requirements apply to such. Where does the Kalurghat factory stand in relation to fire loads? We are told that exit routes were partially blocked by piles of completed garments. This suggests that there was a shortage of space and that fire loads were consequently high.

The National Labour Council in New York have released the names of US companies who allegedly buy from the Kalurghat factory

There have been many deaths in the clothing industry in Bangladesh and there are protests and calls for much more rigorous enforcement of safety standards. There have in fact been arrests in relation to the fire which is the subject of this article. Clothing made in Bangladesh is of course for export. The National Labour Council in New York have released the names of US companies who allegedly buy from the Kalurghat factory³. **IFF**

References

- 1 Enquiries relating to this recently launched electronic monthly to Dr. M. Hirschler on: gbhint@aol.com
- 2 http://news.bbc.co.uk/1/hi/world/south_asia/4745894.stm
- 3 www.nlcnet.org/news/KTS/KTS_Action_alert.pdf

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Very Large Transport Aircraft (VLTA) Fire Protection Needs

By Joseph A. Wright, Sr.

ARFF Technical Services Inc.

Red Lion, Pennsylvania

The principal objective of a rescue and firefighting service is to save lives. The equipment chosen, the number and selection of personnel, and the training received need to be geared towards this goal. The possibility of, and need for, extinguishing a fire that can occur either immediately following an aircraft accident or incident, or at any time during rescue operations, must be assumed at all times.

Any airport rescue and fire fighting service should be equipped, trained, and prepared to handle the largest aircraft anticipated to come into the airport. This training and equipment should all meet international consensus standards such as National Fire Protection Association (NFPA), and International Civil Aviation Organization (ICAO) Standards and Practices and Federal Aviation Administration (FAA) airport certification requirements. This will require the construction of a state-of-the-art training facility that will emulate these large aircraft. Airports that are projected to receive services of the next generation Very Large Transport Aircraft (VLTA) like the Airbus Industries A380 and the Boeing 747-500 & 600 need their fire fighters to receive training at facilities of the size and scope of these new aircraft.

Currently there is no requirement to have airport fire fighters trained in confined space rescue procedures. In the United States there is not a single training facility that provides for second level fire fighting or rescue operations at this time.

Fire fighters need to train using the tools and equipment necessary while replicating second level responses. Currently there are over 2,000 Boeing Model 747 aircraft, which utilize over 150 commercial airports in the United States. The proposed upper level of the VLTA aircraft is only a few feet higher than these current Boeing aircraft models.

Fire fighters need to have an opportunity to develop their skills through extensive training. This training needs to be in the enormity, scope and proportion of these very large aircraft expected to be utilized at some airports around the world. One area that needs to be developed is an extensive confined space training program for aircraft fire fighters. Courses will need to be developed for passenger extrication replicating a scenario where an aircraft receives substantial damage with particular attention dealing with sharp metal protrusions and limited working space. Since a large number of airports worldwide currently receive the stretched Boeing 747 400 Models and future Boeing Models 500-600 aircraft, these particular

Tactics, strategies, and procedures can all be developed in conjunction with training facility simulators that emulate aircraft with second and third-level passenger occupancy. There are none of these second-level trainers in the US at this time



airports should acquire new interior fire training simulators which will provide this kind of a second level seating passenger configuration training onsite. Tactics, strategies, and procedures can all be developed in conjunction with a training facility simulator that emulates aircraft with second and third-level passenger occupancy.

The VLTA due to their multilevel construction and occupancy equate to an airborne high hazard structure. These aircraft will be built with high percentages of composite-based materials to reduce weight and increase fuel economy. Due to the large number of passengers and the potential for a large number of casualties, there is a need for a command presence to oversee the firefighting operations in saving lives if an actual aircraft emergency situation were to occur. Decisions will need to be made that could dramatically impact the outcome of event. It is not acceptable to staff major ARFF vehicles with just an operator/driver on today's airports. In the case of three-level interior aircraft, sufficient additional manpower with senior command decision authority needs to be part of the initial attack teams.

Next generation elevated boom with cabin

skin penetration device on the drawing board at Crash Rescue Equipment Services Dallas, Texas. A prototype high-reach, elevating and extendable boom that can extend as much as 65 feet has recently been developed by the Crash Rescue Equipment Service, Incorporated of Dallas, Texas and is currently being fitted to the FAA's ARFF research vehicle at their plant in Dallas, Texas. Augmented with an elevated piercing device, this boom should be capable of penetrating the upper level of these aircraft even at about 34 feet from ground level and at the level above the second floor window area. These systems can help control the growth of the fires internally until ARFF personnel are able to get external fires under control and position necessary equipment to provide interior landline emergency rescue suppression teams.

The Airbus A-380 will utilize newer more fire resistant material in some areas of its construction. Even with the new Glass Aluminum Reinforced Epoxy GLARE material's extended fire resistance there will still be a need to provide extended interior fire protection utilizing elevated booms with attached cabin skin penetration systems. This will



Cutaway of the Boeing Stretched 747 courtesy of the Boeing Company, United States

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Two views of the Prototype Snozzle EX extended reach elevated boom profile before being fitted to FAA research vehicle at Crash Rescue Equipment Service Inc. of Dallas Texas. Note new unit has two flow turrets for extinguishing agent as well as approximately 34 feet of standoff distance from aircraft



require manpower and equipment for on-site re-supply of these vehicles. It is important that new technologies be incorporated into the fire protection plan of airports worldwide. ARFF vehicles fitted with elevated booms and cabin skin piercing devices will provide these airports with new firefighting capabilities to accommodate the new, larger aircraft carrying in excess of 500 passengers. Because aircraft are more crash resistant today, it can be expected that some passengers will be trapped in wreckage and unable to self-evacuate. The ability to provide early intervention of water into a burning aircraft cabin can extend passenger survivability. These elevated booms can deliver agent low to the ground or

extend to high-reach applications. When needed, they are able to punch a hole into the side of the aircraft and apply agent immediately to the interior for extended survivability. Mounted on an 8X8 high-mobility chassis with independent suspensions, boom devices can move in closer and knock fires down quickly before the fire is fully developed. Vehicles capable of carrying over 15,000 liters (4,000 gallons) can provide initial fire knockdown and still contain sufficient water to sustain interior suppression. Early interior suppression with piercing nozzles is important since it enables handline teams valuable time to organize, coordinate and place equipment to enter the aircraft.





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Composite constructed materials present new challenges for firefighters. A lot of valuable firefighting information is still unknown about the burning of advance composite materials. What will it take to extinguish an aircraft of this large proportion when much more of the A380 aircraft will be made of various composite materials? Will the fires burn hotter? Will they take more extinguishing agent and what about the off-gassings of toxic gases and particulate material? Will it be safe for fire fighters and investigators to walk around in the dust and debris of the burned fuselage material? One solution to these problems has again been tackled by the Crash Rescue. Compressed Air Foam (CAF) at a 20 to 1 expansion ration can be used to stabilize

or immobilize dust and ash that may be caused from the burning of the composite materials. Crash Rescue has developed a down-stream CAF's system that can be installed on any of the large engine-driven pump systems of ARFF vehicles. With the selection or turn of a few switches in the truck cab, a standard truck can be turned into a massive CAF's application tool which can cover large areas of the wreckage with rich wet foam to hold the dust down and provide a safer area for rescue excavation and accident investigation to take place.

Airport Fire Fighters need new tools and equipment. Lacking specialized equipment, present procedures would have firefighter attack teams work off of hand-held ladders to climb up



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Here are two examples of high-reach portable stairway devices designed to provide firefighters with second level access. The one on the right was custom built for Frankford, Germany. The one below was built by BAI Company of Italy



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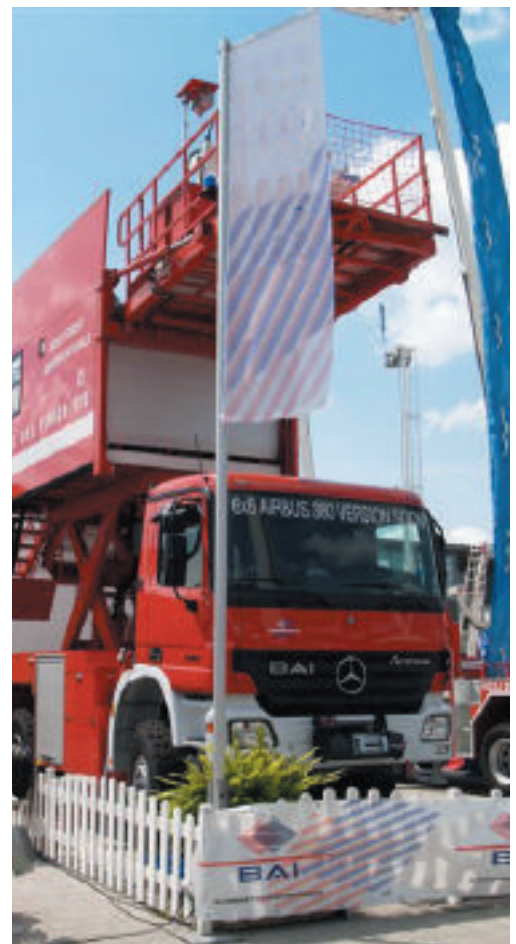
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to these levels, which can be nine meters (27 feet) from the ground, at the second level door sill height; this is unacceptable. This is difficult and time consuming. VTLA will require development of new generations of vehicles and technology to aid in our ability to perform this task. With ten to twelve evacuation slides deployed on each side of the aircraft, newer, elevated devices with extended reach will be needed. Specialized evacuation-assist vehicles will need to be developed to replace failed slides due to fire exposure. Finally, mobile stairways with off-road capability will need to be developed. These mobile stairways need to be



safely driven off road and yet provide extended reach to over 9 meters into the air. These vehicles can be used to assist evacuation when needed as well as serve as platforms to provide tools to perform positive ventilation procedures to remove toxic smoke from the aircraft.

There will be a need to provide extended interior fire protection utilizing elevated booms with attached cabin skin penetration systems. This will require manpower and equipment for on-site re-supply of these vehicles. There will be a need for increased agent quantity carried by initial response crews, larger quantities of emergency medical supplies, a higher magnitude of emergency response geared to the potential of 600 passengers with injuries, related emergency transport vehicle, and medical centers capable of receiving such an influx of patients in a short duration of time. The airport emergency plans as we know them today will have to be upgraded to reflect the potential loss of these new aircraft.

We have a short timeline to perfect new attack strategies and tactics for the new generation of aircraft designs. The first delivery of an AIRBUS A-380 aircraft is due in the late summer of 2006 and will go to Singapore Airlines. They are scheduled to start arriving at select US airports in the fall of FY 2007. These strategies must include increased manpower; larger extendable booms; a specialized ramped vehicle which can replace failed evacuation slides damaged by fire exposure; off-road air stairs capable of reaching 9 meters (27 feet) into the air that can aid in positioning of

positive ventilation tools, emergency medical equipment, and quick response interior suppressions teams. We all must start thinking of these new generations of aircraft as multiple-floor, occupied structures and our course of action and procedures must reflect this important change in aircraft rescue and fire fighting. **IFF**

Joseph A. Wright retired as the Aircraft Rescue and Firefighting Research Program Manager in 2000 after working for the Federal Aviation Administration (FAA) for almost 34 years. He was in charge of the ARFF research programs from 1991 until he retired. He was based at the FAA's, William J. Hughes Technical Center in the Atlantic City International Airport. After retiring from the FAA, Mr. Wright became the President and Manager of ARFF Technical Services Inc located in Red Lion, Pa. Mr. Wright still sits on international standards committees such as the National Fire Protection Association (NFPA) as a technical expert. He has worked with other organizations such as the International Civil Aviation Organization (ICAO) where he was the FAA technical representative for ARFF issues. He worked closely for 34 years with such organizations as the Department of Defense, United States Air Force, Wrights Research Laboratory located at USAF Base, Tryndall, Florida, and the US Navy, Navel Research Laboratory, Chesapeake, Virginia. Mr. Wright was a member of a special aviation committee representing the NFPA Aviation Technical Committee to visit the Airbus Manufacturing Facility in France in 2002 to be briefed on ARFF related response issues.



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Storage Tank Firefighting

By Dave Cochran

Much has been written and said about combating storage tanks that contain flammable or combustible liquids involved with fire. Depending on the size of the tank(s) involved, will obviously dictate the logistical materials involved, including manpower, pumping capacity, water, fire hose, foam concentrate, water, etc. Over the years, many vessels have been involved, but few have been reported.

During a period when the American Petroleum Institute (API), Committee on Safety and Fire Protection was active, we ran a survey attempting to obtain history of these events. We were able to obtain information on but 77 such events world wide. Since that time, however, another was done, and between 1951 and 2003, show some 480 incidents have occurred. These include partial rim seal to fires that involved the complete oil storage facility. The average number of tank fires per year is somewhere in the 15 to 20 range, according to the BRANDFORSK PROJECT. The largest known storage tank to be extinguished was a 270 ft diameter external floating roof tank containing unleaded gasoline in South Louisiana.

Fixed/semi-fixed protection

There is no question the fastest, cheapest AND safest way to combat storage tank fires is through the use of fixed or semi-fixed foam systems. Fixed systems contain a pump(s), foam concentrate tank(s), water supply, piping, valves, etc, that will

allow one to direct the extinguishing supply to the tank(s) involved. Semi-fixed systems have piping running from street connections to the involved tank and require hooking up the necessary line(s) to flow foam solution to the foam chamber(s). These lines in all probability will come from foam equipped fire apparatus. Sub-Surface Injection systems can be arranged the same way, but inject finished foam up through the liquid to the burning surface. Specific application criteria for pressures and flows must be consulted before initiating this method of application. This is critical to prevent fuel pick up in the bubble. It should also be mentioned this method is NOT recommended for any tank containing a floating roof. The reason for this is the roof may prevent the foam in the right proportions from reaching the surface. Nor can sub-surface injection be used on alcohol based fuels.

If you use for example the 270 foot diameter storage tank in South Louisiana, a reported foam application density of .22 gallons per foot was reported, using approximately 30,000 gallons of

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concentrate. If you use the application density of .1 gallons per foot, the recommended rate for fixed or semi-fixed systems, and application time of 55 minutes, you come up with a savings of 20,540 gallons of concentrate. Compute that into dollars and you have saved \$308,100 assuming a cost of \$15.00 per gallon. That savings alone will justify the installation of one of these systems, not to mention the fact these methods are faster in set up time, involve less manpower, and more safe than portable methods. The reason for this obviously is simply because the fire fighters do not have to be near the fire zone. Simply stand back and watch. It should also be remembered that any system, fixed, semi-fixed, portable equipment, etc. are only as good as the maintenance involved with keeping them in good operating condition. For those who have storage tanks, regardless of size, should consider the installation and use of fixed or semi-fixed foam extinguishing systems.

Portable method

Probably the most used method to combat storage tank fires is the one requiring the use of portable firefighting equipment. There are devices available today that deliver up to approximately 14,000 gallons per minute of water/foam mixtures. In addition to the gallons per minute capability, the range of these devices can reach out something over 400 feet horizontally at angles of about 30 degrees for maximum obtainable reach in still air. These ranges are good when the distance between the delivery device and the fire are such that the stream can be placed within the area of the tank surface so that the best possible extinguishing effort can be obtained. For example if a storage tank sits in a tank farm on the outer perimeter, or sits alone with nothing around it to allow the device(s) to be placed in a position that will allow the most effective extinguishment efforts to reach the target, the device could be considered effective and worth its cost. If you have the same vessel located in the middle of a tank farm with say 200 feet between it and other vessels, this same device could be considered a detriment-unless there are sufficient paths for these devices to be placed that will allow the stream(s) to reach the seat of the fire. Any fraction of a foam stream less than it's rated capacity will result in loss of effectiveness, and may require additional quantities of foam

concentrate, which obviously will raise the cost of the foam concentrate needed. It is highly recommended a facility make careful evaluations of their needs before purchasing such devices. Oftentimes it will be far more efficient to purchase devices with less volume and reach so that the money spent will be better spent. It should be mentioned whatever the vessel involved with fire, sufficient delivery device(s) with enough delivery capability and reach must either be on hand or available through mutual aid to handle the largest single hazard of a facility.

Logistics

Logistics involve every thing that might be involved in combating a tank fire. This includes hose, delivery devices, manpower, pumps, foam concentrate – anything that may be required to combat the situation at hand. The size of the facility AND the hazard(s) involved will dictate the logistical requirements necessary to combat a major storage tank fire.

It should be obvious all logistics MUST be on hand and in position to begin extinguishment operations. If plan is to make a successful extinguishment, ALL firefighting foam concentrate should be on hand and in position and prepared to initiate the extinguishment. To begin before this is cause for failure. One cannot afford to begin with a quantity less than that required. To assume a truck load(s) will arrive before extinguishment efforts are completed is ludicrous. Anyone willing to risk this should not be in the business.

If several delivery devices are to be used, each should have its own concentrate supply, which, again, must be in a position to feed each delivery device, without interference with or from the other devices that are to be used. These supplies must be divide up into equal amounts to assure each device has a supply that is capable of operating for the full extinguishment effort. In order to be successful the extinguishment efforts must be maintained until the fire is out. The National Fire Protection Association in its pamphlet NFPA 11, which deals with foam concentrate requirements says the fire should be extinguished in 65 minutes using portable devices. It further states, portable devices shall not be used on storage tanks above in diameter. However, it appears that portable devices are more available for storage tank firefighting than fixed or semi-fixed systems. In fact, one large gasoline tank 270 feet in diameter containing unleaded gasoline has been successfully extinguished using portable devices. It can be done, provided the logistics necessary to make the extinguishment are on hand, hose laid out, pumps in position, concentrate in position, devices in the correct location, etc. One other factor is necessary. The amount of time it takes to get everything ready to begin the firefighting effort will take considerable time. The larger the storage tank, the longer it will take to begin. The 270 foot tank previously mentioned took approximately 8 hours to set equipment and prepare for the actual firefighting.

Many, if not most of these fires occur during inclement weather such as heavy rain or snow storms. This may require the use of heavy equipment such as cherry pickers or canes to place pumps into position to supply water. This may take considerable time to get this type of equipment to

the scene, lift them to the desired position, and set them in a good position in order to perform effectively. Depending on the length of hose lay, it may require a relay to be established to assure the water when it reaches the delivery device(s) it is at a pressure and volume that will allow the last pump(s) to work as efficiently as possible. Once this is completed, then the delivery devices must be set. This too may require this same equipment to put them into position. Once these efforts are done, the hose must be laid-perhaps through water, mud, heavy grass, and other such obstacles which take time. A location must be located for the foam concentrate to be placed for must be positioned (this may be accomplished while the other operations are in progress).

When foam concentrate is delivered, it may be in box trailers, flat bed trucks, pick ups, you name it. The person(s) accepting the delivery should have some knowledge of what is being delivered And, it should all be counted, the type noted, the

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amount noted, type of container, the delivery organization noted, and who shipped or owned the concentrate noted as well. This will give you much information, and, when the fire is extinguished, you will know by another inventory, who sent what, how much, etc. The after fire inventory will then tell you how much was shot, the type that was used, which makes it easier to determine to whom the payout will go. You may well take it all for restocking your inventory as well, as opposed to returning it. And, don't be surprised if your mutual aid neighbors send the oldest perhaps even off spec foam concentrate to your facility, because you are going to replace it with new foam. During a major fire in Port Arthur, Texas in the late 1980's, concentrate was delivered of any

and all types. Some protein types were delivered to non aspirating nozzles, which literally made this foam exit the nozzle as a milky liquid, and had absolutely no value to the firefighter. In fact, it created a danger and allowed the fire to flash back on the crew(s) attempting to make extinguishment in this area, nearly creating burns, and perhaps more serious consequences to those involved. This is a surprise one does not want to happen.

As previously mentioned inclement weather may be involved, which means when using fork lifts to off load or move containers around, the better the surface of the area the better off you will be. If possible make this area(s) one way in and one way out to prevent the backing, turning etc, of the vehicle(s) thus creating a safety hazard



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 **A Kidde Company**

Pic courtesy of Kidde Firefighting National Foam



though it were a cone roof vessel. If vessels are close by, and are partially full, you may want to put water into them to maintain a full vessel—particularly cone roof or internal floaters. A full vessel is better than a partially full or empty tank. **YOU MUST KNOW WHAT PRODUCT WITH WHICH YOU ARE DEALING.**

Spotter(s)

Personnel, at least one, should be positioned 90 degrees from the delivery devices. If possible put them into a position to be elevated. Then you will know if your patterns are hitting the target, and not going short or long. You are going to lose some of the bubbles, no matter what you do. That is the reason for the elevated application density when combating fires of this nature. Spotters may be positioned on elevated platforms, process vessels that will let them see what is going on, and be in communication with the command center.

Command Center

A command center **MUST** be established. This will allow any personnel involved with the event to be in a position to communicate with one another and feed information to the overall person in charge. This may include a unified command in which local authorities, Coast Guard, Security personnel, and other pertinent persons necessary to operate and handle the situation. In today's times you can bet federal authorities, in the United States the FBI and Homeland Security people will be there rather quickly. What better time for interested people to attempt to infiltrate a facility. **BEWARE!**

Wind

It is recommended you check with someone prior to beginning your logistical set up, to find out if a wind change is predicted within the time you are ready to begin extinguishment operations. You certainly don't want to be 90 percent or more complete, then suddenly have a wind change,

forcing you to relocate or go with the decision already made. Knowing the predictions of many weathermen this may be a gamble, but you have to rely on someone or something.

With a following wind, depending on the speed it may cause your finished foam to overshoot the fire, and put finished foam on the leeward side, thus causing it to be wasted needlessly. Likewise, if you are forced to go against the wind (hopefully this will never be the case, but it has happened), you may be forced to move the devices closer to your objective, bear in mind you can get too close, which will force your angle of attack to be too steep, thus going too high, with the net result being you won't get any finished foam onto the fire. If either of these occur the cost of extinguishment will be higher, and you may not be successful. Bottom line is wind can be your friend or your enemy.

Most parts of the world have wind directions that are predominate, but may at times change for short periods of time. Determine the mean direction, and, if it is coming from a direction different from the normal, it may suddenly change and come from that direction. **DETERMINE THIS PRIOR TO ESTABLISHING YOUR DEVICES, LOGISTICS, ETC.**

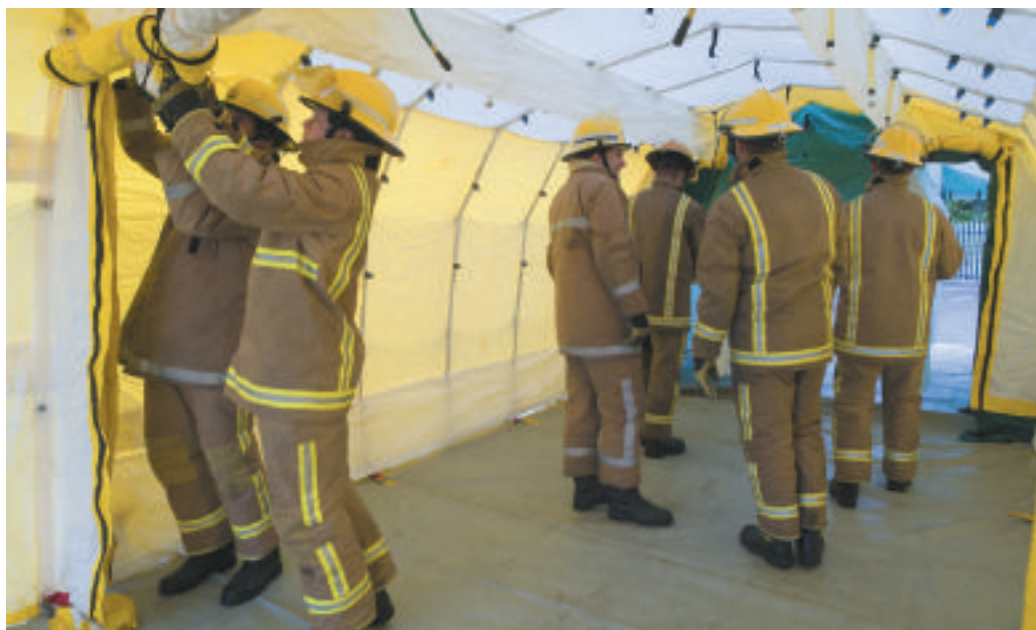
Recommendations

The establishment of your pre-plan is essential to success in any form of firefighting. Storage tank situations are no different. Once your plan is put in writing, placed on computers, it must be given to those who are involved in your pre-plan. **AND**, this plan must be constantly up dated. Like the size up of a fire, your pre-plan may change often. Don't write one up and forget it.

Always make certain all logistics are accounted for. Don't pay for something you did not receive. Have your own personnel—whomever they may be, on hand at the foam concentrate proportioning location. Don't interfere, but count all containers, so that you receive a fair shake when it comes time to pay the bills.

IFF

Generation 2 Decont Technology is Here



If, or rather when, the Civil Contingencies Bill becomes law it has been suggested that it will have the effect of putting the country on a permanent state of alert. It will produce a national civil defence structure geared up to deal with, what a senior government official has characterised as “low probability high impact events”. Although it is true that the emphasis of the £200m that the government is proposing to spend developing this system over the next two years will be spent upstream (on preventative technology; high-tech radiological, biological and chemical detectors and explosives detectors for instance) downstream is still extremely important, and this includes of course mass-decontamination technology.

By Mark Whitcher

Managing Director,
Professional Protection
Systems

It is an interesting fact but history shows the situation always brings forth the technology to handle a particular situation – “deus ex machina” is the Latin tag that neatly encapsulates the idea. As an example the Spitfire arrived just in time to win the Battle of Britain. The bi-planes, that until months before it has made up the core of the RAF, would certainly have not been up to the new situation. So it is with decontamination technology. The second generation is now here and the first generation, based mainly on inflatable decon showers, will no longer be the cornerstone of major-incident mass-decontamination operations.

Of course they will remain the ideal answer, for many years to come, to the smaller decontamination incident ; the RTA and the Hazmat event. Relative low cost, speed of erection, ease of movement all ensure the inflatable its place in the decontamination armoury for years to come. It does have its drawbacks however. The main one is that you simply cannot make an inflatable large

enough to successfully handle the kind of biological or chemical incident that the civil defence planners are now preparing for. This is not simply a question of attending to the decontamination needs of, possibly thousands, of people very quickly, if significant fatalities are to be avoided. The maintenance of order itself in the contaminated area will depend on the speed at which decontamination of individuals can be achieved. Imagine after such an incident if the decontamination units do not do their processing swiftly frightened and traumatised people may start to panic, and try and break out of the cordoned off area. They would either spread the contamination or need to be forcibly restrained and, in extremis, subjected to the ultimate sanction. None of these scenarios is attractive.

Fortunately the Generation 2 decontamination shower that could head off these apocalyptic eventualities is here and up and running. Generation 2 is based on a mechanical articulating frame

amination

technology. Made of aircraft standard aluminium it is light weight, corrosion resistant and deploys rapidly. In 10 minutes, without the need for inflation or poles, a 5.9 metre long, 2.44 metre wide unit (yet weighing only 66kgs), can be up and ready for action. The shower system is integrated into the fire retardant and chemical resistant plastic fabric so no installation is required. A white UV stabilised canopy top provides ambient natural light. The internal set up provides for a male and female track plus a centre track for non-ambulant casualties. This is in fact a casualty conveyor system, the casualty being placed on a conveyor board reminiscent of a giant skate board and sped speedily but safely on rollers to the decon area.

All of these new decontamination showers include a transport bag, ground sheet, windows, utility ports and repair and anchor kits as standard in addition to contaminant containment systems. Other available features include lighting, warm air heating, hot water supply and, to avert build up of gas or vapours, a continuous flow of thermostatically controlled air is provided through the unit. Also floors with an anti-slip finish manufactured from re-cycled plastics can be provided.

These Generation 2 Decontamination Units have also been designed with some sensitivity assuring privacy for their users during the process. This is particularly essential when you realise that in practice the individuals being processed would be, to put it mildly, in a highly nervous state. The decontamination process takes in undressing, shower, wash and rinse followed by drying and dressing. Each individual is also provided with an individual labelled storage bag for their possessions, which they can reclaim at the end of the process, when they would also receive their clearance certificate to allow them to leave the contaminated zone.

It has to be calculated that in the event of an incident of the kind being described a certain number of individuals are not, for whatever reason, going to wait for the official decontamination unit to get to work but will self-report themselves at their local hospital A and E department. This is an area where the inflatable decontamination unit, either as a single cubicle or x3, comes into its own. Its throughput will be nothing like the approximate 200 ambulant casualties plus four non-ambulant that Generation 2 can deliver but it can perform a useful ancillary role in this way.

The Generation 2 decontamination unit has also brought forth the first range of protective suits dedicated to the needs of personnel involved in different aspects of a decontamination incident. Three suits are needed to cover the requirement. First is one for the Cold Zone. This requires a chemical splash suit. This features a double storm flap, zipped front and elasticated wrist and face apertures. A full face chemical respirator provides air flow demisting for a low profile polycarbon visor.

A special feature of this suit is a multi-purpose combination filter manufactured from microfibre and organic compounds that offers a 99.99% @ 95 lts/min particulate retention efficiency. The

safety boots that come with it have to be slip proof, chemical and oil resistant and be able to stand hot contact up to 300°C. So do the gloves which are also resistant to UV and Ozone and Chemical resistant to EN 374 and offer mechanical protection up to EN 388.

For the warm zone another suit is required. Chemical splash this has to be an all enveloping one piece with a clear Teflon coated PVC visor. It has a unique neck seal and an internally worn air blower system with combination filtering canisters, whilst boots and gloves are the same specification as the Cold Zone model.

The third suit is an NBC escape suit. This features an extra large anti-claustrophobic hood and a visor with an anti-fog coating. Breathing is via a snorkel type mouthpiece. This is sealed through the front of the hood and attached to a plastic cartridge. A gas tight seal is formed between the wearers lips and the mouthpiece so that the air inside the mouthpiece is completely isolated from the air inside the hood. This means that if the integrity of the hood or the neckseal is compromised, for any reason, the wearer can still breathe clean air through the mouthpiece.

If I seem to have dilated at length on the specifications of these dedicated suits it is to demonstrate how far and how sophisticated the decontamination process has become since 1996 when my company, PPS, launched the first inflatable decontamination shower.

There is yet a further dimension to be added to the picture. A requirement for a fourth suit type has now been met. A training suit. All modern front-line suits for use in decontamination incidents, whether made for cool or warm zones, have one thing in common. They are of necessity made from limited life material and it is not economic to use them in training. With the vastly increased sophistication of the Generation 2 decontamination technology training is becoming more important than ever before and for this reason a low price training suit has been introduced. Made from lightweight PVC and clearly marked "Training Suit" this unit is a simple one piece with an optically clear PVC visor and a standard non-gas tight zip across the chest.

Where next? As the civic nation goes on the defensive so will private business and industry. Besides the fact that the employers duty of care to employees is taken seriously as never before in our society commercial and industrial establishments are just as likely to be the focus of a terrorist incident as any governmental institution. So they will need to be prepared for it in the same way. Already a variant of the Generation 2 decontamination shower is being offered as a secure employee shelter in the event of a bio or chemical attack, and obviously the inflatable decontamination shower is an ideal choice for commercial or industrial site. Ideally and ultimately this state of preparedness has to be injected from the national and civic level into every home in the country and to become part of the awareness of every individual. Recognising this we are already working on a first response suit, that could even be offered as a consumer product in juvenile and adult sizes, and stored in the car or in the cupboard under the stairs, where another generation used to keep the gas masks. Then, like our protective clothing, our level of readiness will be all embracing. **IFF**

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WHEN SAFETY MATTERS

Hazardous Environment Response using a “Mission Control” Approach

By **Andrew Balaschak**

Senior Product Marketing Manager and

Bob Durstenfeld

Director of Corporate Marketing, RAE Systems, San Jose, California

On January 6, 2005, a 42-car train traveling through Graniteville, South Carolina crashed into a parked locomotive. A number of the cars contained hazardous chemicals: resins, kaolin and sodium hydroxide. Three cars were 90-ton tank cars, each carrying full loads of chlorine. Only one cracked, almost immediately releasing 80 tons of chlorine gas. During the immediate aftermath and over the next 10 days of cleanup there were over 600 casualties and nine fatalities.

Although Graniteville represented the largest chemical release in the United States in 27 years¹, it was just one example of situations where first responders used a rapidly deployable, wireless hazardous materials detection system to protect life and property. Rapidly deployable wireless gas detectors were used to form a perimeter around the incident. The wireless system remained in place for well over the week required to contain and remediate the accident. Monitored from a remote command center, the monitoring system allowed first responders to focus on the critical tasks of saving lives without the need to station a person in protective gear to monitor each instrument locally.

Moving Away From “One-man, One-meter”

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Developed in partnership with leading first responder organizations, wireless hazardous detection systems have been widely adopted. They are used daily to respond to emergencies, providing reliable real-time, on-scene data. They are used

to monitor refineries, chemical plants, and other industrial facilities, as well as in ad-hoc hazard situations, including the air monitoring of public venues during major events.

Terrorist Attack or Accidental Chemical Release

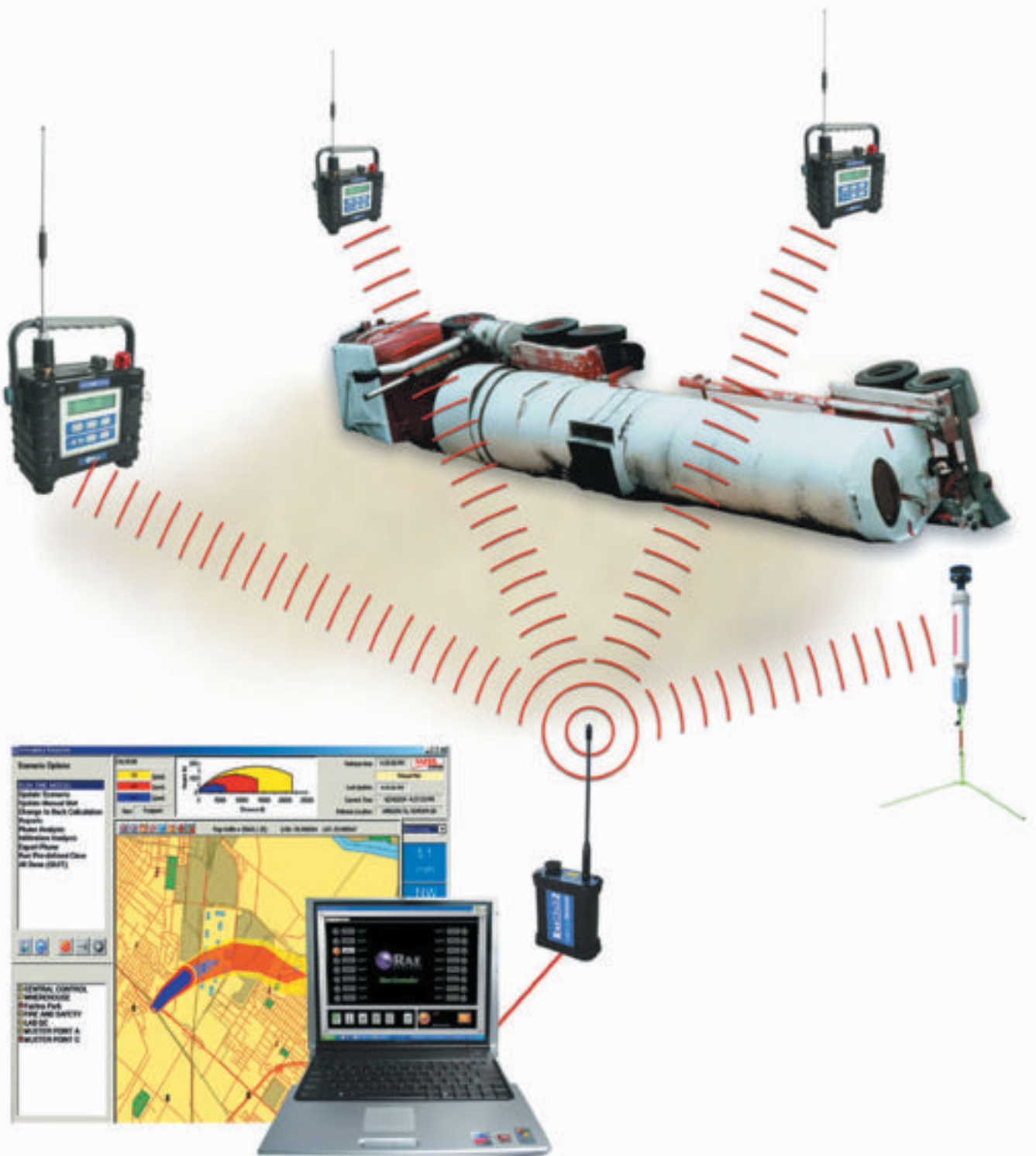
The difference between attack and accident is one of intent, but to the first responder the task remains the same – the preservation of life and property. Wireless hazardous environment detec-

The convergence of three technologies, gas and radiation detection, wireless communications, and powerful computers, has fostered the creation of an entirely new tool for first responders: The Rapid Deployment Hazardous Environment Detection System.

tion systems have been deployed by first responders, law enforcement, government agencies and industrial users to protect the public at numerous incidents and major events. Key elements of an effective system should:

- Deliver rapidly deployable monitoring of a spill or accident while allowing personnel in the incident command center to remain at a safe

¹ Carolina Fire Rescue EMS Journal, Fall 2005



distance and evaluate the need for personal protective equipment (PPE).

- Delineate a safe operating zone, inside which PPE should be worn while the incident is being contained and cleaned up.
- Model and predict a vapor plume in the broader region so that evacuations can be coordinated and minimized to only the necessary zones to save both time and money.

- Provide community awareness during a toxic release and the ability to measure the resulting plume.

Facility and Venue Protection

In addition to responding to HazMat incidents, there is increasing security focus on high-profile public buildings and special-venue protection. Wireless hazardous environment detection plat-

forms combining chemical and radiation detection are ideally suited for rapid, scalable, and highly adaptable deployment at a wide variety of locations that require security against terrorist threats or industrial accidents. Wireless systems have been used to protect over 100 major public events around the world. Environmental monitoring, using multiple, wireless monitors, at events can alert security personnel and first responders to dangers and provide time and life critical information to help make evacuation or shelter decisions.

Essential Elements of a Rapid Deployment System

Rapid deployment wireless systems have been in service with first responders for only three years. Since the development and deployment of these solutions, key lessons have been learned about the essential system elements needed for effective response to both intended and accidental hazardous incidents:

- A complete line of field-proven monitors to meet a variety of needs
- Portability and Rapid system deployment capability
- Flexible re-configuration with an open instrument and wireless platform
- Integrated weather information, GPS location and plume measurement
- Data portability

Let's look at each of these critical elements in more detail.

A Complete Line of Field-Proven Products

The system should offer rugged, weather-resistant wireless gas and radiation monitors that can be field reconfigured to measure oxygen, combustibles, toxic industrial chemicals (TICs), gases, and gamma radiation. The monitors should be able to support Global Positioning (GPS) mapping.

Photoionization detectors (PID) give early warning for a variety of volatile organic chemicals (VOCs) that might be of concern, such as fuels, pepper spray and some chemical warfare agents.

The system should offer rugged, weather-resistant wireless gas and radiation monitors that can be field reconfigured to measure oxygen, combustibles, toxic industrial chemicals (TICs), gases, and gamma radiation.

PIDs also provide early indication of possible flammable compounds before an Lower Explosive Limit (LEL) sensor. An LEL sensor is useful for detecting most combustible gases such as hydrogen, propane, and methane. Many people consider the oxygen sensor as the ultimate broadband detector. As little as a one percent deficiency in

atmospheric oxygen levels can be life-threatening, and an oxygen-rich environment increases the risk of explosion or fire. Further, a 0.1% decrease in oxygen concentration can indicate the potential presence of 5,000 parts-per-million of something else being present. Toxic gas sensors must be available for such chemicals as: ammonia, carbon monoxide, chlorine, hydrogen cyanide, hydrogen sulfide, nitrogen oxide, nitrogen dioxide, sulfur dioxide, and phosphine. Finally, a gamma radiation sensor must be available to warn of the presence of any dangerous radioactive material.

These instruments must operate on a robust wireless network capable of supporting a large number of monitors over a wide area with a

It is important, however, to avoid being too integrated. For example, some sensors for chemical warfare agents (CWAs) are very sensitive, easily contaminated, expensive and specialized in their application.

proven host controller. They must provide GPS information so that their location is automatically identified on a map at the base station or command center. Additionally, the system must be an open platform that allows the integration of best-of-breed, third-party sensor solutions such as weather stations, chemical warfare agent detectors, and other applications.

It is important, however, to avoid being too integrated. For example, some sensors for chemical warfare agents (CWAs) are very sensitive, easily contaminated, expensive and specialized in their application. Standard operating procedures should use broadband sensors to show the existence of a threat prior to deploying specific sensors and identifiers.

Rapid System Deployment

Systems must be specifically designed for rapid deployment in temporary monitoring applications lasting a few hours, a few days or even weeks. Considering that hazardous material response teams arrive on scene after an event, it is critical that the wireless system be deployed and be in service in less than five minutes. This rapid deployment is enabled through the integration of:

- Multiple sensors and the data radio or wireless modem in a single unit.
- Fast start-up of the wireless monitors.
- Automatic host controller set-up and network activation without the need for on-site software re-configuration.
- A robust wireless communications architecture. Highly specific communication means the system operates immediately. Communications that are secure and resistant to interference or

jamming, and deliver a two-mile operational range.

Experienced wireless hazardous environment detection system vendors provide rapid deployment kits designed for quick assessment and management of hazardous environments. These kits should include in-storage charging for both the wireless sensors and the host controller. These systems must scale up to 32 monitors to allow multiple agencies to combine resources. All these components must be transportable in rugged carrying cases.

Ease of Use

Above all, a rapid deployment system must be easy to use. Despite its wide-ranging capabilities, all of its operations should be controlled through icon-driven software on a single laptop personal computer (PC).

Flexible Configuration and an Open Platform

Because a rapid deployment system is designed to be quickly deployed in any response scenario, it must be able to accommodate a wide range of detection equipment. The system should be able to support both the system vendor's equipment and third-party devices, all easily integrated and operating wirelessly while providing data for incident commanders through a single user interface.

Integrated Weather Information and Plume Measurement

An integrated, wireless, portable weather station is another critical component of the system solution. The weather station must be able to be set up in seconds to provide on-site integrated weather information. An integrated weather station, real-time wireless gas monitoring and GPS combine with mapping and computation algorithms to enable true plume measurement, as opposed to traditional plume modeling.

The difference between plume modeling and plume measurement is the ability to "back-calculate" the chemical release rate based on

The weather station must be able to be set up in seconds to provide on-site integrated weather information. An integrated weather station, real-time wireless gas monitoring and GPS combine with mapping and computation algorithms to enable true plume measurement, as opposed to traditional plume modeling.

measured weather and gas level information in real time. Traditional modeling solutions like ALOHA have required first responders to know the chemical release rate, something that is often impossible to estimate. A modern system only requires the time, location and chemical that is released.

Data Portability: A Powerful New Approach

Fixed sensing networks have often provided data portability, but portable, ad-hoc networks have never before been able to have their data displayed remotely. Rapid deployment hazardous environment detection systems change monitoring from a "one-man, one-meter" approach to a "mission control" scenario. Measurements from multiple sensors are transmitted by a wireless network to one location where they can not only be viewed on one computer, but transmitted to other locations worldwide, via the Internet, for simultaneous viewing. This provides enhanced safety for the responders, who can set sensors in place and move to a known safe location, plus it allows experts at remote locations to assist in monitoring and decision-support.

By having all sensor data in one place, the incident commander can alert downrange personnel to hazardous changes while the downrange personnel remain mission focused on their operation tasks. In addition, data can be stored for later review and for future training.

Data portability provides instantaneous situational awareness in an Incident Command (IC) center. It also facilitates sensor "fusion" by providing the ability to employ multiple sensors to deliver a broad range of protection. By having all sensor data in one place, the incident commander can alert downrange personnel to hazardous changes while the downrange personnel remain mission focused on their operation tasks. In addition, data can be stored for later review and for future training.

Modern rapid deployment systems leverage the power of the Internet to aggregate multiple wireless networks, allowing access to critical information in real time from any location in the world. Because this data is truly portable, multiple viewers can simultaneously see and share current as well as historical data via a standard web browser on any computer.

Conclusion

The transition from "one-man, one-meter" to "mission control" is well under way. Modern rapid deployment hazardous environment detection systems have been in use for a number of years and have become widely accepted in the HazMat community in North America. Their proven performance has established their place in the first responder's "tool box." They have moved beyond the first responder application and into refineries and industrial plants, and they are currently used to protect people at many public venues. They have successfully changed the way in which we respond to many emergencies and will continue to change response procedures in the future.

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The chemistry laboratory fire in France, March 2006

An explosion shortly after midday on 24th March 2006 in a chemistry research laboratory at the National Advanced School of Chemistry, Mulhouse, France, caused one fatality and many non-fatal injuries. There was also extensive building damage. This piece is being written exactly 24 hours later, when detailed information is still unavailable. It will therefore draw such conclusions as are possible at this early stage and make some pertinent comments. A simple calculation will also feature.

By J. C. Jones

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It is certain that there was a significant blast at the fire at the School. There was a loud explosion and destruction of windows and other fittings. This suggests a hydrocarbon fire which was confined. A possible course of events is that a flammable solvent vapour ignited and did so under confined conditions so that there was a significant overpressure. In such occurrences the blast energy is about 5% of the heat of combustion. The calorific value of acetone, a common organic solvent, is 31 MJ kg^{-1} , so if a kilogram of acetone burnt under such conditions there would be blast energy of about 1.5 MJ. A perspective on this amount of energy follows in the boxed area.

A motor car when cruising will be utilising mechanical energy at a rate of typically 50 kW. A quantity of energy equivalent to the blast energy produced during the confined explosion of a kilogram of acetone could therefore sustain the car in cruising for a period:

$$1.5 \times 10^6 \text{ J} / (50 \times 10^3 \text{ W}) = 30 \text{ s}$$

An amount of energy sufficient to propel a car at cruising speed for half a minute clearly has great destructive potential. We can therefore argue that laboratory-scale amounts of whatever chemical exploded in the accident in France can cause blast effects which are lethal. To these of course have to be added danger to life from the heat and possibly from the smoke.

The overpressure in the recent laboratory accident in France might possibly have been caused by confinement as previously mentioned, also perhaps by enhanced turbulence if the vapour/air mixture had been well mixed by encounter with obstacles such as furnishings before igniting. This sort of combustion behaviour is deflagration with an overpressure and propagation is subsonic. It is *not* detonation. The meaning of this word has become broadened in common usage so that it has, wrongly, almost become synonymous with 'explode'. A detonation is a distinct type of combustion behaviour characterised by supersonic speeds and a cellular structure to the propagation wave. It is doubtful whether any

organic gas or vapour released into air at atmospheric pressure would detonate.

Returning to the laboratory accident under discussion, leakage of a flammable solvent and its ignition having mixed with air is not the only possibility. Another is sudden catastrophic leakage of an organic vapour. To understand how this might have happened we need to grasp the meaning of the term BLEVE: **boiling liquid expanding vapour explosion**. As the author has pointed out in an earlier contribution to this periodical¹ a BLEVE is a physical phenomenon not a chemical one, and there have been fatal BLEVEs involving water vapour. If however the substance having undergone a BLEVE is flammable and ignites on release there will be a fireball which, in a confined space, will have an overpressure. This could have been the case in the recent accident had a container of a flammable liquid somehow become sufficiently hot to explode because of the internal pressure of vapour. We can weigh, very tentatively, this idea against that discussed previously of explosion of a confined vapour/air mixture having been raised in turbulence. The fireball following a BLEVE will have a duration of the order of seconds and will provide an ignition source for anything flammable within the space engulfed by the fireball. That there were such secondary fires is clear: we are told that the fire service arrived to 'thick smoke'. The reason a fireball lasts for several seconds is that initially most of the vapour is at a concentration in air above the upper flammability limit and diffusion of air to dilute it to within the flammable concentration range requires time. In the type of explosion considered earlier the vapour-air mixture at ignition is uniformly much more dilute than that at an incipient fireball. We'd intuitively expect such an explosion to be less effective at causing fire spread than a 'BLEVE-fireball'.

These are ideas which the official follow-up will no doubt consider and the 'fire fighter community' will be following its deliberations with interest. **IFF**

Reference

1 Jones, J. C., 'Flammable liquid fires', *International Fire Fighter*, May 2005, pp. 45-48

TRAINING



Pic courtesy of Texas Engineering Extension Service

ICET: the international risk, crisis and disaster



Real threats

Today's threats are real, the need to respond is urgent and the stakes are high. From natural disasters, such as severe earthquakes, landslides, building collapse and flooding, to technological incidents like chemical spills, high-rise building fires, CBRN, and terrorists threats, fire and rescue services across the globe need to prepare, plan and respond as if there is no tomorrow. Coordination with other emergency agencies and departments is crucial, as are training and exercises for front-line personnel. On-scene commanders need to have access to tools and equipment necessary to take control of any situation quickly and effectively.

According to the World Bank, more than 95 percent of all deaths caused by disasters occur in developing countries. Moreover, developing countries suffer the greatest costs when a disaster hits. Losses due to natural disasters are 20 times greater (as a percentage of GDP) in developing countries than in industrialized countries. Implementation of risk reduction programmes and local response mechanisms are increasingly recognized as key issues in policy development for governments all over the world.

Risk managers find it increasingly difficult to keep abreast of the challenges they face and seek

assistance from independent policy advisors to develop and implement disaster risk reduction plans. The International Centre for Emergency Techniques (ICET) has been providing this assistance for nearly fifteen years. ICET is an international institute for risk, crisis and disaster management, founded in 1993 and based in The Netherlands. The Institute's main area of expertise is disaster management with a special focus on the development of multidisciplinary emergency prevention and preparation, the upgrading of response networks and multidisciplinary training of rescue professionals

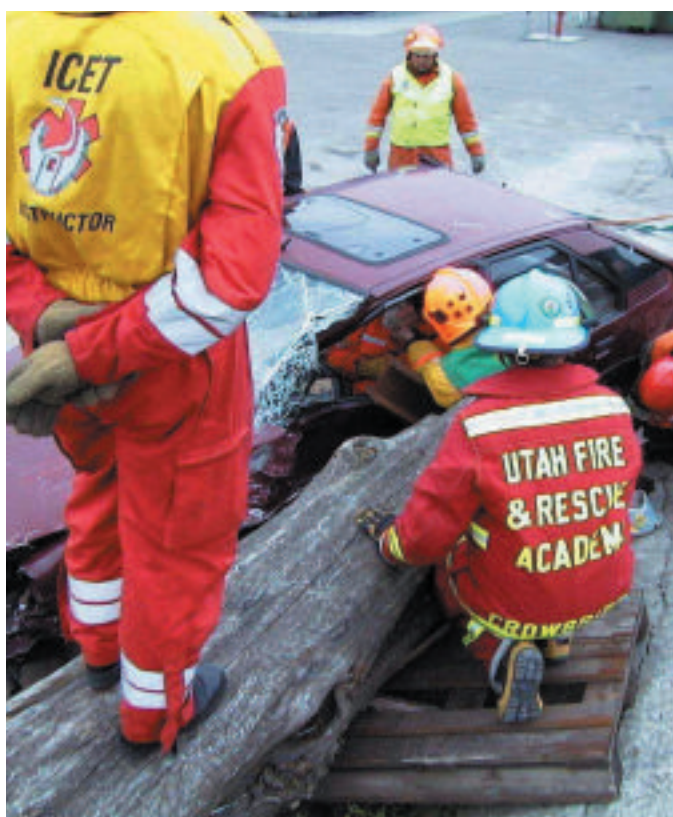
ICET has a clear mission: To reduce human suffering and economic loss by actively promoting sound risk reduction strategies based on international technology, lessons learned and exchange of knowledge.

More than thirty countries worldwide have already benefited from ICET's expertise.

Within the framework of World Bank, UN, European Union, local or bilateral programmes ICET has worked in, amongst others, Turkey, the Russian Federation, the United States, The Netherlands, The United Kingdom, Spain, Vietnam, Sri Lanka, China, Argentina, Belgium, India and the Ukraine. Civil protection, ambulance services, trauma teams, hospitals, fire brigades, public administrations, private industries are within the scope of beneficiaries of ICET's work.

Rescue network upgrading

ICET has a proven track record of developing, upgrading and implementing complete rescue networks at national, provincial, district and (metropolitan) city levels. Through



nal partner for ster management



its many years of experience, ICET has developed a systematic approach to improve disaster preparedness and response systems. Activities such as risk analysis, disaster benchmarking, preparing feasibility studies, investment planning, mixed credit financing, disaster management planning, procurement, community awareness planning are within the range of ICET's international technical assistance.

ICET, over the past years, has evaluated disaster preparedness in, for example, Argentina. The Ministry of the Interior was provided with a set of recommendations for the improvement of its response systems as well as the establishment of a fire and rescue training academy. In Europe, the Mediterranean Metropolitan City of Izmir in Turkey has established a rescue training centre based on ICET's planning. The Centre recently hosted a foreign USAR team for a wide variety of realistic exercises. The Centre was only one aspect of a comprehensive plan for emergency preparedness

in the Aegean region. ICET not only developed the plan, but worked closely with the local authorities to implement the system. The AKS 110 rescue network has made a significantly positive impact on the rescue capacity of the local government with a proven reduction in mortality and morbidity.

ICET has since used the lessons learned in Izmir in countries as diverse as the Russian Federation, India, Vietnam, Spain and Cuba.

With this in mind, newly appointed Minister for Disaster Management, Hon. Mahinda Samarasinghe of Sri Lanka, received Jan Meertens, founder of ICET, to discuss his strategy for Disaster Management in the country that was so severely affected by the 2004 Tsunami. The Minister discussed the comprehensive report on Natural Disasters of the Select Committee constituted by the Sri Lankan parliament that he had chaired before taking on the new post of Disaster Management and Human Rights Minister. The meeting between the two focussed on Early Warning,



Emergency Preparedness strategies and lessons learned by ICET and others around the world.

SAVER training

Planning is rendered worthless if there is no proper training. Thousands of disaster managers and rescue personnel from all over the world have undergone the practical, cross-cultural and multidisciplinary training programmes of ICET. When complexity increases, a rescue team must be able to operate within a framework of easy to use procedures. For this, ICET has developed the SAVER method. Since its inception, the Systematic Approach to Vital Emergency Response (SAVER) has amply proven its benefits to rescuers from all over the world. Prof Dr Marc Sabbe, professor of Emergency Medicine, University of Leuven, Belgium: 'SAVER brings a unique link in the management of accidents'. SAVER is about working together, mutual aid and communications.

Different terms for the same result. We open eyes, facilitate exchanges of skills and build teams. Firemen, trauma doctors, dog handlers, nurses, civil protection staff and many more have been trained to use SAVER as their common, multidisciplinary, operational mode. ICET and associated training institutes offer a variety of SAVER courses, such as:

- medical training;
- multidisciplinary rescue;
- Urban Search And Rescue (USAR);
- Incident command.

The Lancashire Fire and Rescue School at Washington Hall, UK, has recognized the value of SAVER and is one of the certified SAVER training providers. This and other providers, deliver SAVER entrapment rescue courses.

Courses in which participants are trained in the SAVER approach to an accident with entrapment or severe casualties. Courses specialize in automobile, collapsed buildings, mass transportation

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By Tim Sendelbach

Chief of Fire Training
Savannah Fire &
Emergency Services

SCBA Confidence on the Fire Ground

Self-contained breathing apparatus (S.C.B.A.) in years past was considered a tool used only by those firefighters of less ability, a tool of shame if you will. Today, the modern fireground reflects one of many lessons learned from our predecessors, S.C.B.A. usage as a norm, rather than that of exception.

Today's firefighters are faced with a greater risk of inhalation hazards due to the many by-products of combustion, some of which were never before imagined. Unfortunately, many lives continue to be lost despite the advancements in technology as it pertains to self-contained breathing apparatus and the strictly written national standards and departmental operating procedures/guidelines. In the year 2000 alone, five (5) firefighters lost their lives due to inhalation related injuries and several others died from asphyxiation following structural collapses.

In response to the continuously high rate of firefighter injuries and/or fatalities linked to respiratory related incidents, the Occupational Safety and Health Administration (OSHA) adopted the highly debated 29 CFR 1910.134 regulation on respiratory protection in April of 1998. To many, this standard is recognized solely for its infamous 2 in/2 out ruling. Unfortunately, few have properly identified what this regulation brings forth as it pertains to respiratory protection and S.C.B.A. training for the modern firefighter.

This article* and the associated drill sessions have been designed to identify and set forth a training program that supports compliance with this regulation and its required S.C.B.A. usage and competency training.

Presentation

The use of self-contained breathing apparatus is considered a basic tool of the firefighting trade. Unfortunately, with this general assumption comes a complacent mindset and lackluster efforts in annual training and proficiency testing. The unending respiratory hazards faced by the modern firefighter bring forth a need for continuous evaluations in the use and proficiency of self-contained breathing apparatus. As trainers, we must design and develop drills that challenge and motivate those experienced members while maintaining a high degree of realism.

This article will provide a detailed training simulation that reinforces personal proficiency while emphasizing standardized emergency techniques to be initiated when encountering a sudden hazardous event on the fireground.

*This article/program is in no way offered as a full-fledged respiratory protection program, rather a suggested training program to meet specific competency requirements set forth in OSHA CFR 1910.134 and the other applicable NFPA standards.

Critical factors to consider in confidence training

Psychological and Physiological problems – In order to become and/or maintain proficiency in the use of an S.C.B.A., a firefighter must overcome any psychological or physiological barriers associated with the operation and use of an S.C.B.A. Although few firefighters will openly admit it, we all face these barriers to some degree. Psychological barriers might include simple hyperventilation during stressful or complicated operations that may lead to a rapid decrease in operational work time, dizziness and/or light-

Typically these problems are the direct result of improper or insufficient training early on in ones career. Regardless of their causes, we as trainers must quickly identify these issues amongst our members and attempt to remedy them with safe and effective training methods.

headedness. Physiological barriers might include an episode of claustrophobia due to the unusually tight working conditions or inability to determine his/her surroundings. Typically these problems are the direct result of improper or insufficient training early on in ones career. Regardless of their causes, we as trainers must quickly identify these issues amongst our members and attempt to remedy them with safe and effective training methods. S.C.B.A. confidence training takes time and each individual must be allowed to progress at an acceptable pace to ensure these barriers are identified and overcome successfully.

Competency based skills

S.C.B.A. Emergency operations:

Throughout a firefighters career he/she will face a variety of equipment failures that may jeopardize his/her safety if not quickly corrected. No such failure is equal to that of an S.C.B.A. emergency during a firefighting operation. Today's firefighters

must maintain a high degree of confidence and personal proficiency in handling S.C.B.A. emergencies. The following; although not comprehensive, is a list of the most common S.C.B.A. emergencies encountered by firefighters and some suggested solutions for each:

PLEASE NOTE: The four most critical actions in each of these situations are:

- Remain CALM
- Notify Your Partner/Command
- Activate Your P.A.S.S. Alarm
- Search For/Find An Exit

Facepiece Removal – Firefighters should be taught NOT to remove their facepiece if at all possible. Human nature is to immediately attempt to remove the facepiece; proper training and strict discipline must be enforced to prevent such

**Firefighters should be taught
NOT to remove their facepiece
if at all possible. Human nature
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remove the facepiece; proper
training and strict discipline
must be enforced to prevent
such action.**

action. Failure to follow this rule may expose firefighters to super-heated air and toxic gases causing immediate death. Remember, your facepiece is your lifeline to your S.C.B.A., without it, your chance of survival is drastically reduced.

Air Supply Stoppage – Get as low as possible, begin an emergency assessment by first attempting a ¼ turn of your purge/by-pass valve, no air, check your cylinder valve.

Early Low-pressure Alarm Activation/Decreased Air Flow – Check the cylinder valve to ensure it is turned on completely, if not corrected, ¼ turn the purge/by-pass valve, activate your P.A.S.S. alarm, and search for an exit.

Depleted Air Supply – Get as low as possible to avoid breathing superheated gases found in the upper levels of the thermal column, activate your P.A.S.S. alarm, attempt to locate an exit, if unable to locate an exit immediately, disconnect your regulator (low-pressure hose if waist mounted regulator) and place a gloved hand over the facepiece opening or low-pressure hose and begin searching for an exit.

Cracked, Broken or Damaged Lens – Get as low as possible, cover the damaged area with a gloved hand to filter out the particulate matter, activate your P.A.S.S. alarm and search for an exit.

Ripped or Severed Hose – Immediately cover or hold together the affected hose with a gloved hand, activate your P.A.S.S. alarm, and search for an exit.

Air From Regulator Discharging Uncontrollably – Immediately attempt to control the leakage with a gloved hand, if unsuccessful, conserve your air supply by turning the cylinder off – hold your breath, turn the cylinder on ¼ turn to allow

yourself to inhale, turn it back off and hold your breath, if unable to locate an exit immediately, continue this process, activate your P.A.S.S. alarm, and continue searching for an exit.

Audible Leak From Hose Connection at the Cylinder Connection – Immediately drop to one knee to avoid unnecessary exposure to superheated gases, turn the cylinder valve off, tighten the high-pressure connection, and turn the cylinder valve back on. If the leak persists, immediately search for an exit.

Confidence based skill training

THE TRADITIONAL STUD WALL/WALL BREACH

Simulation: As a firefighter/rescuer, you become trapped in a room or begin to experience a rapid change in fire development; your only means of egress is to breach a wall to safety.

Activity Steps:

1. Close the door to the room (if possible) to lesson fire impingement.
2. Using the Halligan Bar, break a hole through the first layer of sheetrock.
3. Lift the Halligan Bar to an upright position (forcing the tool into the wall, while holding the pike end).
4. Forcefully pull down on the pike end (using a can opener motion to enlarge the opening).
5. Remove the Halligan Bar.
6. Place both hands (wide grip – one high, one low) inside the opening and pull towards your body.
7. While on all fours, turn and reverse kick the wall section to remove the remaining section.
8. Check the floor stability with the Halligan Bar.
9. Check environment – tenable/untenable, floor stability, etc.
10. Secure the Halligan Bar on the opposing side of the obstacle.
11. Reduce profile proceed through the wall opening.

Reduced profile manoeuvre Option 1 (Partial Escape):

- Fully loosen the right shoulder strap and remove it.
- Loosen the waist strap to allow the harness assembly to be rotated around to your left hip.
- Grasp the neck of the cylinder with your left hand.
- Rotate the harness assembly to the left to allow you to pass through the obstacle.
- Proceed through the obstacle.
- Don the S.C.B.A. (tighten both shoulder straps and waist belt).

Reduced profile manoeuvre Option 2 (Full Escape):

- Fully loosen the waist belt (and disconnect the buckle), and both shoulder straps.
- Remove the right shoulder strap, then the left shoulder strap
- Maintain a firm grip on the left should strap Reduce your profile (rotate to the left w/ your right shoulder facing the obstacle).
- Proceed through the obstacle pulling your S.C.B.A. assembly through with your left hand.
- Don the S.C.B.A. (tighten both shoulder straps and waist belt).

Reduced profile manoeuvre Option 3 (Cylinder First Approach):

- Rotate around to a position where your cylinder is facing the obstacle.



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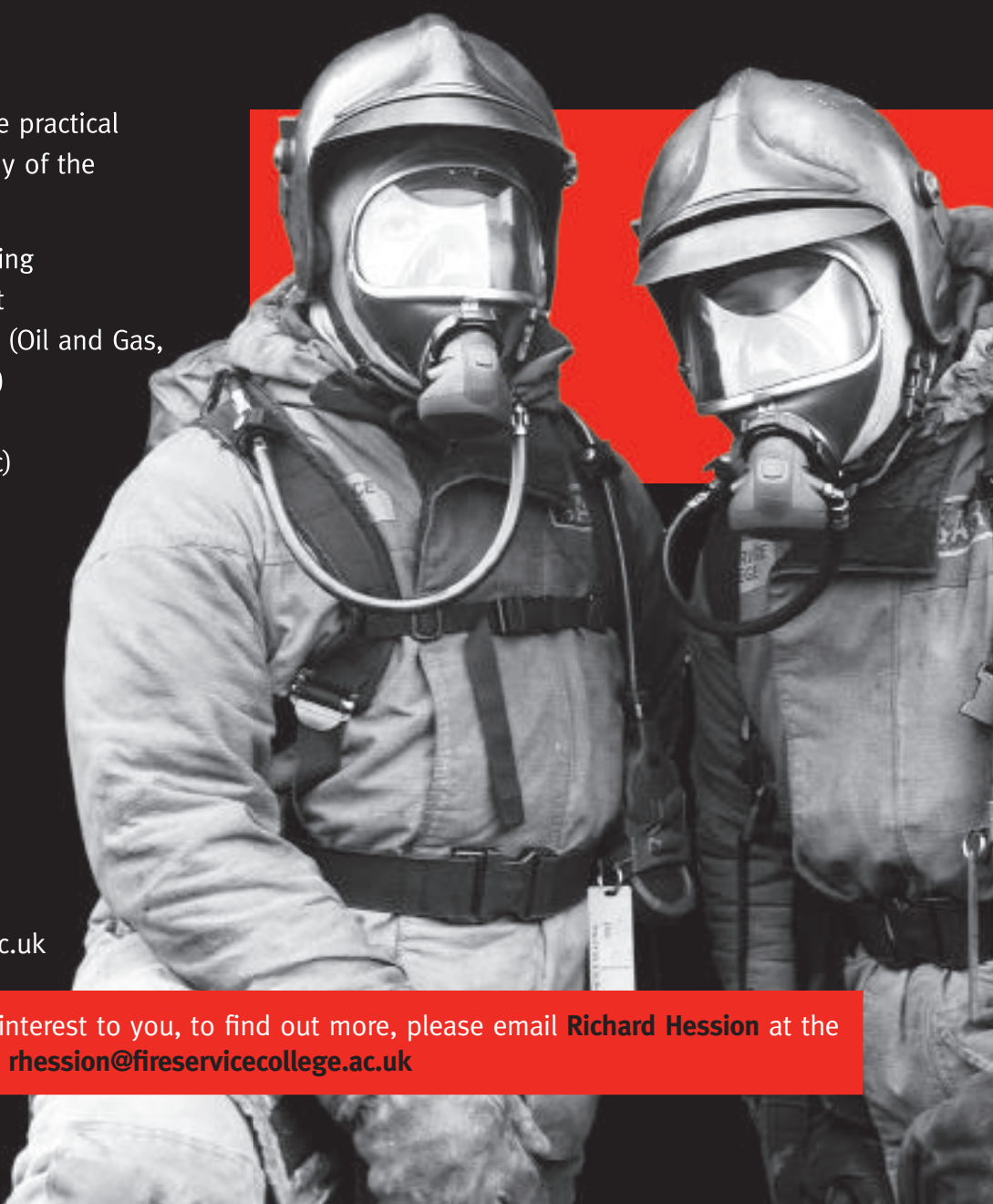
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- Place the cylinder into the opening while rotating your right shoulder and foot through the opening.
- Proceed through with your left shoulder and left foot.
- Readjust your S.C.B.A. as necessary.

Skills Reinforced:

Emergency egress techniques – The emphasis of this drill is to reinforce the concept of maintaining and/or creating a secondary means of egress while further emphasizing the need for firefighters to carry forcible EXIT tools during every firefight.

Emergency escape techniques – The concept of reduced profiles has been taught for many years, continual retraining enhances personal confidence while providing several alternatives for firefighters who become trapped following a sudden hazardous event such as a collapse, or rapid fire develop – i.e. flashover.

Attic simulator w/scuttle access

Simulation: As a firefighter you're required to enter into an attic space to check for extension and/or to advance a hose line for fire attack.

Activity Steps:

1. Assume a low position (roll on your back or a left lateral position).
2. Proceed forward to the identified opening (space between joist assembly).
3. Grasp the joist assembly with both hands while rotating your S.C.B.A. assembly to position that allows the cylinder to pass through the opening. Depending on the member's physical size, a full escape procedure may be necessary.
4. Pull yourself up through the assembly and assume a balanced position atop the joist assembly.
5. Readjust your S.C.B.A. straps as necessary.

Skills Reinforced:

Emergency escape techniques and reduced profiling – Although these techniques are presented as means of emergency escape, many of these reduced profiling techniques can be and oftentimes

Particular emphasis should be placed on establishing user proficiency while preventing compromise of the personal protective ensemble.

are deployed during normal operations on the fire ground. Particular emphasis should be placed on establishing user proficiency while preventing compromise of the personal protective ensemble.

Large box – low profile crawl

Simulation: As a firefighter/rescuer, you're involved in a structural collapse in which you're trapped in a small void space, in an effort to self-rescue you must assume a reduced profile and proceed through a narrow opening.

Activity Steps:

1. Proceed forward; identify the size and shape of the opening.

2. Perform a full-escape manoeuvre as described earlier.
3. Maintain a firm grip on your S.C.B.A. with your left hand.
4. Push the S.C.B.A. (cylinder valve first) through the opening.
5. Lower your left ear to the floor while assuming a kneeling position (torso elevated).
6. Allow your helmet to clear the obstruction and proceed forward while laying flat on the floor.
7. Once you have cleared the obstruction, maintain a firm grip on the left shoulder strap (hold tightly to the left breast) roll in a counter clockwise motion (onto the S.C.B.A.) to allow the right shoulder strap to fall into position for donning.
8. Tighten your shoulder straps and waist belt to a position of comfort.

Skills Reinforced:

Emergency escape techniques and reduced profiling – The idea of working in tight and/or confined area is something many firefighters fear, yet seldom speak openly about. This simulation provides those less vocal members with an opportunity to develop confidence when encountering such a situation while at the same time providing a continuous challenge to those more experienced members.

Attic simulator w/entanglement hazard

Scenario: As a firefighter/rescuer, you become trapped or entangled in flexible spiral ductwork, and cable TV wiring, in order to escape you must successfully overcome the entanglement hazard.

Activity Steps:

1. Stop forward movement!!!
2. Take one step back (identify the entanglement hazard, if possible)
3. Assume a left lateral position w/ your S.C.B.A. cylinder at or near the floor.
4. Rotate you arm (beginning at your waist) in a backstroke swimming motion.
 - a. Lift entanglement up and over your head/cylinder
 - b. Proceed forward
 - c. Notify crewmembers of the hazard – assist as necessary.
5. If still unsuccessful:
 - a. Rotate ¼ turn clockwise (Continue to rotate until obstruction is identified)

CAUTION: Do not rotate more than half way around.

- b. Rotate your arm again (reverse stroke motion)
- c. Lift entanglement up and over your head/cylinder.
- d. Proceed forward
- e. Notify crewmembers of hazard – assist as necessary.
- f. If still unsuccessful, rotate counter clockwise ¼ turn
- g. If still unsuccessful, remove the S.C.B.A. harness and attempt to disentangle and/or cut the obstruction using lineman's pliers.

PRIOR TO REMOVING YOUR S.C.B.A.

HARNES:

1. Notify command
2. Consider activating your P.A.S.S. alarm

Skills Reinforced:

Self-rescue techniques for entanglement hazards – The emphasis of this drill is to provide the

entangled member with a step-by-step approach on how to successfully overcome the reoccurring hazards of entanglements. Particular emphasis should be given to notifying command early to ensure a rapid response of a Safety Engine/RIT rescue team to ensure your immediate rescue if self-rescue efforts fail.

Small box w/multiple low profile obstructions/hole

Simulation: As a firefighter/rescuer, you're involved in a structural collapse in which your trapped in a small void space, in an effort to self-rescue you must assume a reduced profile and proceed through a narrow opening followed by an immediate decent into a small opening in the floor assembly.

Activity Steps:

1. Proceed forward; identify the size and shape of the opening.
2. Perform a full-escape manoeuvre as described earlier.
3. Maintain a firm grip on your S.C.B.A. with your left hand.
4. Push the S.C.B.A. (cylinder valve first) through the opening (maintain a firm grip on the S.C.B.A. assembly with your left-hand).
5. Lower your left ear to the floor while positioning yourself in a near kneeling position (torso elevated).
6. Allow your helmet to clear the obstruction(s) and proceed forward while laying flat on the floor.
7. Once you have cleared the obstruction, maintain a firm grip on the left shoulder strap.
8. Lower your S.C.B.A. into the hole (positioning left or right – based on direction of travel).
9. Proceed head first into the hole (lead with the shoulder opposite of the direction you intend on going – i.e. going right, lead with the left shoulder).
10. Rotate your torso as you proceed through the opening.
11. Continue crawling to the opening in a low profile position, leading with the S.C.B.A. cylinder valve first.

Skills Reinforced:

Reduced profiling – This simulation requires the participant to manipulate their body through multiple obstacles while keeping their protective ensemble in check. The concept of reduced profiling and/or full escape manoeuvres enables the participant to overcome the obstacles in a safe and effective manner. This simulation will very quickly identify any fear of restrictive motion (i.e. claustrophobia) while at the same time; establish self-confidence and personal satisfaction upon completion.

T-box – low profile simulator

Simulation: As a firefighter/rescuer, you're involved in a collapse situation which requires you to assume a low profile while crawling towards an exit.

Activity Steps:

1. Assume a prone position with your S.C.B.A. assembly placed in front of you.
2. Maintain a firm grip on the left shoulder strap.
3. Begin crawling to the identified opening, if obstructed, back up and locate the next available opening (feet first) and exit.
4. Upon exiting, maintain a firm grip on the left shoulder strap (hold tightly to the left breast), roll in a

counter clockwise motion (onto the S.C.B.A.) to allow the right shoulder strap to fall into position for donning.

5. Tighten your shoulder straps and waist belt to a position of comfort.

Skills Reinforced:

Emergency escape techniques and reduced profiling – This simulation is designed reinforce the participants confidence in reduced profile manoeuvres during void space operations. A continued emphasis should be placed on the concept of self-survival and emergency escape operations.

Summary

The use of an S.C.B.A. is a requirement of nearly every firefighter across the country on a daily basis. S.C.B.A. usage and training is oftentimes considered basic by nature; S.C.B.A. confidence is a proficiency level every firefighter and trainer must continually strive to achieve. All too often in this repetitive based profession, we find ourselves challenged by the restraints of time and personal commitment in areas thought to be of greater concern; as firefighters working in an ever changing society, we must constantly be reminded of the fact that no commitment is greater than that of our personal safety and survival. Our confidence in these basic skills provides us with that highly sought after edge which enhances our safety, the safety of our crewmembers, and ultimately the safety of the men and women we are sworn to protect.

Dedication

As I conclude this article, I would like to extend my sincere thanks to the brothers and sisters of the Memphis, TN, Pittsburgh, PA, and Missouri City, TX Fire Departments for sharing with us the many lessons learned and the tragic events that led to their injury or loss through the various video clips, articles, and investigative reports that have circulated the fire service. This article is dedicated to ensuring that we the fire service learn from the past in hopes of providing a safer future. **IFF**

Article courtesy of www.rapidintervention.com

Tim Sendelbach is a 17-year student and educator of the fire & emergency services currently working as the Chief of Fire Training for Savannah Fire & Emergency Services, Georgia.

Tim formerly served as Assistant Fire Chief for Missouri City Fire & Rescue Services, Texas and as a Firefighter/Paramedic with the Kansas City, Kansas Fire Department. Tim has earned B.S. degrees in Fire Administration, Arson and an A.S. degree in Emergency Medical Care from Eastern Kentucky University.



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Tactical Firefighting & CFBT

A 21st Century Approach to Saving Firefighter's Lives



By Paul Grimwood

www.firetactics.com

Training for offensive (interior) firefighting operations is perhaps now more important than ever. The modern day firefighter needs both a theoretical and practical understanding of how fires develop and are likely to behave under a wide range of ventilation parameters, in a selection of single compartment, multi-compartment and structural settings.

Such training should place great emphasis on how fire gases are likely to form and transport within a structure and must clearly define the term '*risk assessment*' inline with the hazards associated with flashover and backdraft phenomena and other forms of rapid fire progress. Further to this, the varying range of offensive firefighting applications including *Direct Attack* (using both water & CAFS); *Indirect Attack*; and 'new-wave' *3D water-fog* applications should be clearly explained and practiced under a broad range of firefighting conditions.

This training may prove costly but is essential if the safety of firefighters is to be advanced. In countries such as Sweden, the UK and Australia, structured Compartment Fire Behavior Training (CFBT) programs have effectively reduced the life loss and serious burn injuries suffered by firefighters to forms of rapid fire progress and resulting structural collapse.

Past experience has demonstrated that live training burns in unoccupied or derelict structures can often breach the fine line drawn between 'realism' and 'safety', even where national guidelines are closely followed. Such training fires also provide varying situations and conditions that are often unpredictable and may be difficult to repeat or control for the sake of uniformity in teaching basic principles. In Europe it has long been recognized that purposely designed structures offering optimized fuel-loading within a geometrically coordinated compartment, provide the safest environment in which to teach firefighters how compartment fires develop whilst also demonstrating a range of fire suppression and control techniques. Such facilities also offer the most economical option to train firefighters whilst effectively creating *realistic but controlled* conditions within.



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The steel shipping container offers versatility, adaptability and a ready made modular approach in constructing cheap but effective burn buildings and 'flashover' simulators. The single compartment observation; window and attack containers have been used in Europe for over 20 years to demonstrate fire growth; rollover; flashover and backdraft phenomena whilst enabling firefighters to witness fire gas formation, transport and ignitions from extremely close quarters with their safety being the prime concern. It is from such close quarters that firefighters are then able to practice and evaluate the various firefighting options and suppression techniques, offering them an unequalled experience and providing an element of confidence in relation to structural firefighting. The simulators are also used to teach door entry techniques whilst recognizing a range of fire conditions from the exterior, including the *under-ventilated fire*.

There is no heavy fire-loading during training evolutions and in reality the events experienced inside the simulators are likely to happen faster in the 'real' world in a compartmentalized environment that is genuinely unfamiliar to the firefighter.

However, it is essential to remember that these modular trainers are only simulations of more realistic conditions and a training fire can never truly replicate the 'real' event for reasons of safety. There is no heavy fire-loading during training evolutions and in reality the events experienced inside the simulators are likely to happen faster in the 'real' world in a compartmentalized environment that is genuinely unfamiliar to the firefighter. Even so, the modular simulators are as close to 'realism' as one would wish to take firefighters in a training environment, where temperatures at shoulder height are regularly taken above 350°C for several seconds during the evolutions.

It is also important to advance the CFBT training principles in stages from single compartment observation and attack units to the multi-compartment, multi-level designs now becoming popular. To assist the design of multi-module simulators the use of CFD modeling and past empirical research must be encouraged if such facilities are to remain *safe and effective*. Without multi-compartment training, using proven designs, the firefighter will fail to grasp an overall appreciation of how tactical venting actions are likely to affect surrounding and adjacent compartments (to the fire) in the complete approach to a structural firefighting operation and any appreciation of realistic *fire gas transport* and involvement is lost.

- **Compartment Fire** – Involves one room or space only.
- **Multi-compartment Fire** – Involves more than one room/space, possibly on different levels.

- **Structural Fire** – Involves multi-compartments/spaces where elements of structure have been breached or involved, thus threatening structural stability.

WARNING – *Single compartment systems are subject to limitations in that they can only prepare the firefighter for door entry procedure and one-room fires. To appreciate the operational implications associated with fire gas formations, transport and ignitions as well as tactical venting options/actions inline with crew advancement techniques in a 'structural' setting, the concept of CFBT training must be allowed to evolve into multi-compartment modular structures to provide an all-round approach. The use of LPG fuelled systems do NOT serve adequately to teach fire behavior but do provide a facility where nozzle techniques may be practiced.*

There are strict controls of safety advised for the use of such units and these include –

- 1 All firefighters should be fully hydrated before entering the simulators and re-hydrated at the end of training.
- 2 Both outer layers and undergarments of protective clothing should be of a high standard and include flash-hoods, ensuring all exposed skin is fully covered at all times. Clothing should be loose fitting, allowing an air-gap between undergarments. Damp clothing should not be worn inside the simulators.
- 3 There should be at least two hose-lines fitted with fog-nozzles available during the training. They should be fed by separate pumps and also supplies where possible. The interior line is managed by a maximum of 4-6 students and one instructor and the exterior line is managed by a safety officer and instructor.
- 4 Personnel are assigned specifically to operate ventilation hatch controls.
- 5 There should be at least two points of exit available to firefighters inside the simulators.
- 6 The rear doors of observation simulators should remain open at all times during occupation of the facility.
- 7 Simulators used to demonstrate 'backdrafts' should not be occupied by any personnel at any time during the training.

In 1991 the Fire Technology Laboratory of the Technical Research Center of Finland (VTT) carried out research into the *operation and safe use* of container style compartment fire simulators. Johan Mangs and Hakan Kruse reported on the results of

They emphasized the intention was to avoid any progression to full flashover whilst the unit remained occupied and that maintaining control of the environment by cooling the gases in the overhead was critical to safety.

this research in Fire International Magazine (UK) December/January 1992 p32-38. They carefully assessed the heat-flux and monitored temperatures at various locations, including those areas occupied


by firefighters. They concluded that a 500mm x 500mm roof hatch was suitable and that the simulator design based upon the Swedish model is safe and effective for use and occupation by firefighters as a method of teaching fire behavior and gaseous phase extinguishing techniques. **They emphasized the intention was to avoid any progression to full flashover whilst the unit remained occupied and that maintaining control of the environment by cooling the gases in the overhead was critical to safety.** They demonstrated maximum temperatures of 200°C at shoulder height and up to 400°C at top of helmet for a few brief (2-3) seconds were experienced by kneeling students during repeated ignitions of the gas layers.

A further study by the University of Central Lancashire (UK) (K. Roughley) in 1999 reported maximum temperatures of 150°C were experienced at the shoulders of crouching firefighters inside the observation simulators.

Recent CFD research into fire simulators is flawed

There have been two recent research projects that have both attempted to use Computational Fluid


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Dynamics (CFD) to resolve situations of reported 'dangerous conditions' linked to excessive temperatures experienced at firefighter locations inside CFBT container style simulators. However, these research projects are seriously flawed in that CFD cannot (at this time) model firefighting water applications. The research was further prompted by two fire authorities who apparently failed to follow the original Swedish guidelines relating to safe practice in the simulators.

The first research report appeared in the May 2002 edition of Fire Prevention & Fire Engineers Journal (UK) where Nick Pope (p33-36) reported 'overly high temperatures within a flashover training simulator used by London Fire Brigade (at the Fire Service Training College – Moreton) had made

Further still, the firefighters were reported as occupying an 'observation' unit and if this is the case, they would not enter AFTER the fire had been developing for some time (as stated) but would have occupied the compartment prior to ignition.

the simulator 'dangerous' for use by trainee firefighters. He went on to describe how CFD was used to model conditions within the simulator and resolve the 'overly high temperatures' by increasing the ventilation hatches from one to three. What this research failed to account for was the water applications (*pulsing water-fog*) that are (*should be*) used to control the environmental conditions within the simulator, ensuring temperatures at firefighter locations do not become overly high. The report referred to temperatures at the entry point in excess of 600°C but these were at ceiling level! Further still, the firefighters were reported as occupying an 'observation' unit and if this is the case, they would not enter AFTER the fire had been developing for some time (as stated) but would have occupied the compartment prior to ignition and observed the fire's development from its incipient stages through to 'flashover', whilst controlling the upper level temperatures with a pulsed application of water-fog. If the unit was an 'attack' unit then they would have entered sometime after the fire had begun, practicing door entry techniques and applying a cooling fog into the upper gas layers just prior to entry.

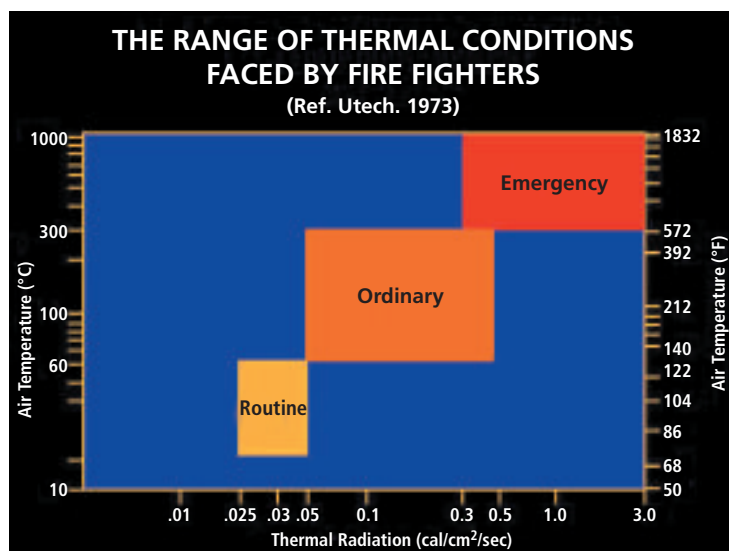
The second research report appeared in the November 2002 edition of

FIRE Journal (Australia) and the authors admitted their research was prompted by the original 'Pope' report in the UK. The Brammer & Wise research was initiated by the Australian Capital Territory (ACT) Fire Authority following similar reports of 'dangerous conditions' existing inside a CFBT container simulator. Again they resorted to CFD modeling to provide solutions to excessive temperatures experienced at firefighter locations and again they altered the ventilation arrangements to 'improve' conditions. However, again there is no mention of water applications or environmental control and it appears that the ACT firefighters were occupying the space without any water available to them at all as they observed a fire develop through and *beyond* its flashover stage!

The two reports concluded with recommendations for improving conditions within the simulators and yet failed to reference previous research in this field that had already dealt with these aspects. The reports also failed to account for any cooling effect of water on the gaseous-phase state and the likely influence this might have for ensuring temperatures are controlled and maintained at safe levels. The fire authorities involved appear to have been using the training simulators outside of universally accepted safety guidelines, totally unaware of the design features and training objectives of the simulators in use.

Such research can be totally misleading if allowed to stand alone, unchallenged, and these reports could form the basis of future design specifications of CFBT simulators, suggesting to current users that their own units may be dangerous. This would be far from the truth where the Swedish design and user model has been followed. It is also unnecessary and ineffective and fire authorities using such simulators in future would be well advised to acknowledge the long history of past experience and scientific research that already ensures that, if followed, the Swedish model of CFBT simulations remains the safest and most effective option. They should also ensure that instructors are both trained and qualified under the original Swedish model and that local adaptations in design, training or use of the units are carefully reviewed for safety, with the original specifications and training objectives in mind.

IFF



Some Reflections on the 2003 Taegu¹ Subway Station Fire

By J. C. Jones

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On 18th February 2003 one hundred and ninety-two lives were lost as a result of a fire at an underground train station in Taegu, South Korea. A few of the details of particular note will be briefly discussed in this commentary, starting with the very sad fact that the fire was started intentionally. An individual with a history of mental illness set fire to the interior of one of the six carriages comprising a train, using gasoline as an accelerant. About four litres of gasoline were so used.

The gasoline was remarkably effective in its macabre application. Only two minutes after ignition within one of the carriages the other five were on fire, and there was spread to another train also with six carriages so twelve carriages in all were affected. There were fatalities in both trains. We can elicit some points of interest from the fact that gasoline was used. A common 'choice' of accelerant by arsonists is kerosene which, of course, is of higher boiling range than gasoline. It is also less easy to ignite: it usually has a flash point not below 40°C whereas a gasoline will have a flash point below 0°C. When kerosene is used as an accelerant it is splashed over combustible items such as upholstered furnishings and carpets and a match or taper applied to a site visibly soaked with the kerosene in order to bring about ignition. The match or taper needs to be held in place for time at least of the order of tens of seconds, possibly minutes if the material having soaked up the kerosene is itself resistant to ignition, and had the arsonist at Taegu used kerosene in this way he'd no doubt have been intercepted and restrained before any serious harm was done. The kerosene vapour would not have ignited meanwhile.

In the event gasoline was used and its ignition in response to a small flame would have been immediate. Gasoline vapour would have burnt as such and propagated with a flame speed of the order of metres per second. This is much faster propagation than that of flaming solids where the thermal inertia restricts the propagation rate. Heating of the interiors of the carriages by the gasoline combustion did however cause some breakdown of some of the combustible installations in the carriages such as seats. Such breakdown products are themselves flammable and their ignition feeds back and promotes ignition of

the seats, carpets or whatever. Ignition can be followed by one of two sorts of propagation: flaming or smouldering. The author's intuition is that the latter would be more probable and this view is supported by the fact that there was abundant toxic smoke. In the combustion of furnishings and carpets smouldering is much more productive of smoke than flaming. It is recorded that once the fire was extinguished fire fighters were delayed for two hours in recovering bodies from the train because of the smoke, and it is probable that the smoke rather than the heat was the agent which caused some of the deaths.

When kerosene is used as an accelerant it is splashed over combustible items such as upholstered furnishings and carpets and a match or taper applied to a site visibly soaked with the kerosene in order to bring about ignition.

As for the spread of the fire from one train to another as noted, this required that the space between them be occupied by flammable materials by means of which the combustion could progress. Seats, flooring and advertisement boards made of combustible materials including polyethylene provided for this, and this was noted in the follow-up as a deficiency as was the propensity of materials within the carriages to ignition when heated. The other issue arising from the fire – the danger to the community from persons intent on destroying themselves and others – is less easily addressed. **IFF**

¹ Alternative spelling Daegu.

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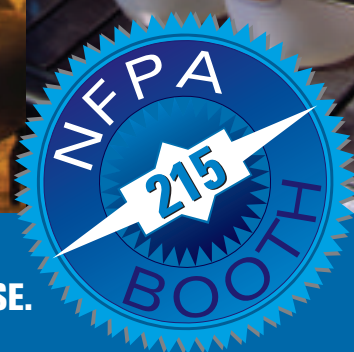
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An MDM PUBLICATION
Issue 11 – August 2006

INTERNATIONAL FIRE FIGHTER

Reporting Worldwide to Municipal, Industrial and Fire Training Professionals



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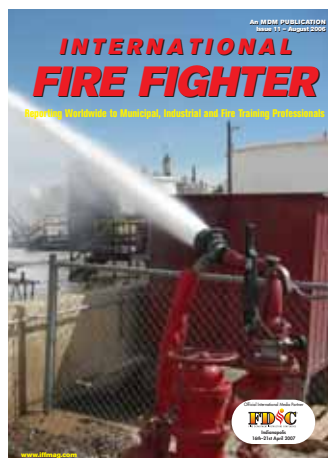
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INDUSTRIAL FIREFIGHTERS

August 2006 Issue 11



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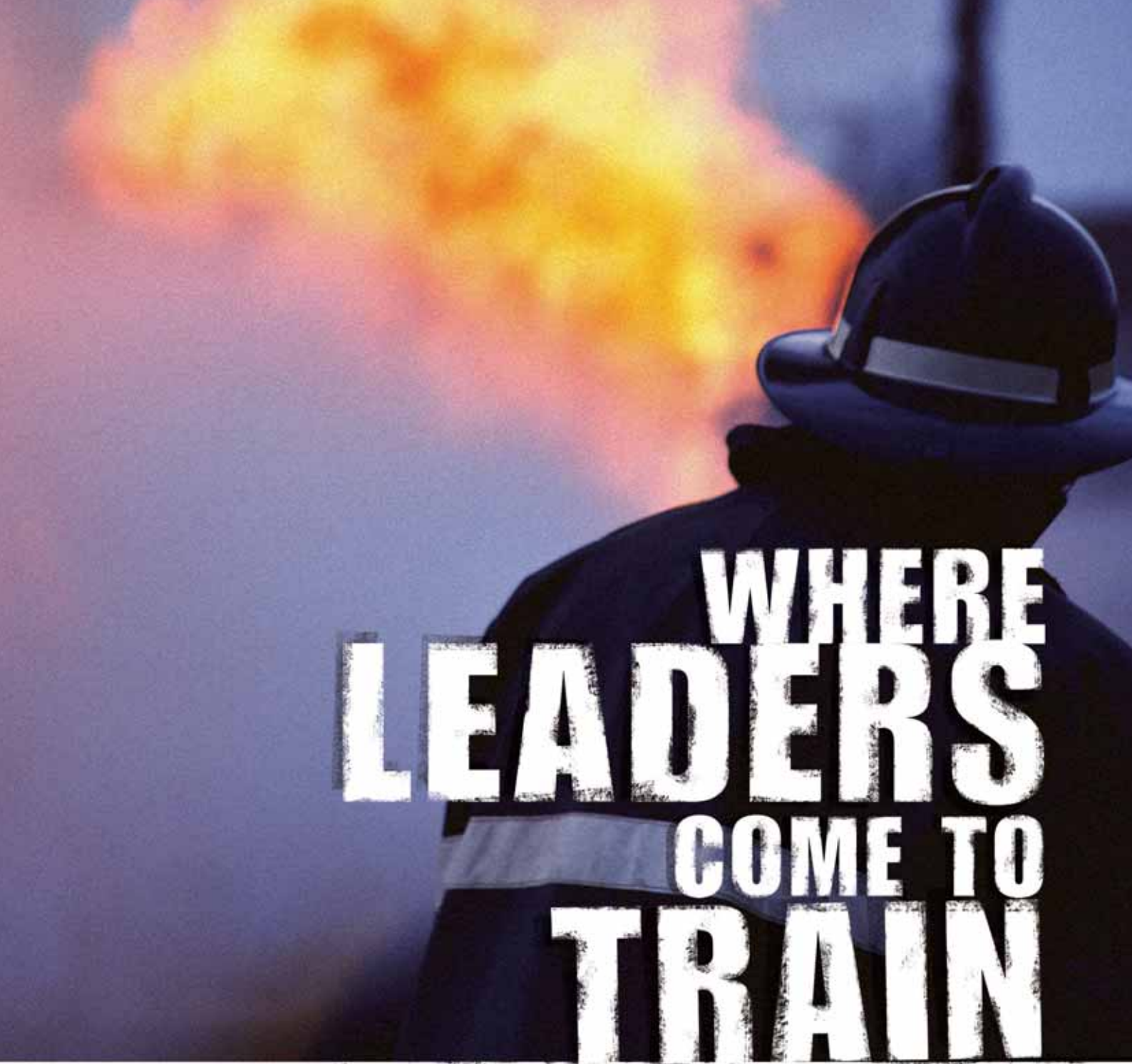
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WHERE LEADERS COME TO TRAIN

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Where Leaders Come to Train

Draeger telemetry takes fireground safety to a new dimension

Believed to be the first entry control system of its kind, the new Draeger PSS Merlin takes the guesswork out of entry control and accountability procedures and brings a new level of monitoring and protection to firefighting applications.

Fast and accurate, the Draeger PSS Merlin incorporates an entry control board, the DraegerMan Bodyguard and a portable radio unit attached to the firefighter's BA set. Using radio technology to continuously transmit and receive data from up to 12 individual firefighters simultaneously, this self-contained, state-of-the-art electronic system is able to remotely monitor their exact status and safety from outside the incident. As a result, and unlike traditional manual or semi-manual systems, the PSS Merlin provides Entry Control Officers with a continuously updated supply of vital information, thereby enabling them to react immediately in an emergency.

Meeting the requirements of TB1/97 and JCDD40, the transponder based control board is based on the standard UK control board with additional electronic displays. Fully automatic and able to support rapid deployment procedures, it provides one continuous display channel for each firefighter simultaneously, with full manual back up if required.

Incorporating Tally Control operation, Bodyguard combines pressure indicators, temperature monitoring and distress signalling in one unit. Most importantly, this provides the wearer, (as well as the Entry Control Officer via the PSS Merlin) with an accurate calculation of remaining air time which is updated every second and is based on current air consumption.

Firefighters log on individually by removing the tally from Bodyguard and inserting it into the control board. They are then allocated a specific channel and two-way communication is established immediately. Each channel displays an on-line signal, ADSU alarm signal and evacuation and withdrawal signals. These signals can be given, received and acknowledged by the BA wearer or Entry Control Officer.

The Entry Control Officer can select whether to view time to whistle, time of whistle, cylinder pressure or temperature, and additional data can be displayed according to requirements. Group and individual evacuation commands are also supported by a separate voluntary withdrawal facility and, in the event of a radio signal being lost, audible and visual warnings will alert both the BA wearer and Entry Control Officer.

Moulded with carrying handles for maximum portability, the unit is robust and powered by two rechargeable nickel metal hydride batteries. Data logging is also possible for post-incident analysis.

PSS, Bodyguard and Merlin are registered trademarks.

Further information is available from:
Danielle Smith, Draeger Safety UK Limited,
Ullswater Close, Kitty Brewster Ind Est.,
Blyth, Northumberland NE24 4RG.
Tel: 01670 352891. Fax: 01670 356266



Believed to be the first entry control system of its kind, the new Draeger PSS Merlin takes the guesswork out of entry control and accountability procedures

HAZTEC

NEW IMPACT 360 DEGREE GENERATION 3 LED ULTRA- BRIGHT COMPACT BEACON

Magnetic mount

HAZTEC's new LED compact beacon has been designed primarily for magnetic mount following past problems with some magnetic beacons being unsafe to use at high speed.

The Impact beacon is only 85mm High and has a diameter of 80mm at the base.

It uses a new higher power magnetic material with a pull strength of 60kgs even though it has a diameter of only 48mm.



A moulded rubber protection cover is supplied although for very high speed use it is recommended that the magnet should be used without this cover.

The Impact magnetic beacon



will shortly be tested and certified for high speed use.

Mast mount

A cast base model is available for use on motorcycles and can be supplied with extending masts with either internal or external cables.

Permanent mount

The three hole permanent mount base is ideal where a low profile but high powered beacon is required.

The Impact LED Beacon is available in 12v or 10-30v and in Amber – Blue – Green – Red or Dual colours and has nine selectable flash patterns plus constant on and carries a five year warranty.

For more information, please contact:

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Moorfield Estate, Leeds LS19 7BN
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Fax: 0113 202 9158
Email: info@haztec.biz

The protective fire safety on airports is generally considered to be one of the most complex and greatest challenges for the fire services – and thus also for all manufacturers of fire fighting vehicles. IVECO MAGIRUS offers a world-wide unique product range for holistically covering all potential hazards that must be met on airports.

With the airport crash tender range DRAGON x4, x6 and x8, IVECO MAGIRUS offers three variants in this “top of the range” category, that will meet even the most specific requirements. The IMPACT series, with the variants x4 and x6, is the ideal completion to the DRAGON range or even a cost-effective alternative, e.g. for smaller airports.

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Williams Fire & Hazard Control



For the last 13 years Williams Fire & Hazard Control has hosted an annual Advanced Flammable Liquid Firefighting workshop in honor of its founder, Les Williams.

Co-hosted by partner ANSUL® this event has become notorious for addressing industrial firefighting in ways not seen elsewhere.

This year's event saw a resurgence of international travel and participation by Industrial and Municipal fire professionals from all points on the compass.

In the wake of "9/11" international travel drastically fell off. Travel visas were difficult to come by and facility members around the world were kept close to home – poised in anticipation that some new terrorist event may affect anyone, anywhere, anytime. However, this year the event set new records for international attendance from regions across the globe, including The Netherlands, South America, Canada, and North America.

Recent weather related emergencies have compounded a growing emphasis on the interrelationship between municipal responders and their industrial neighbors, bringing industrial and municipal responders closer together – in their planning, in their training, and in their responses.

Over the last several years, the XTREME Industrial Fire & Hazard Training event – held annually in Beaumont, TX – has seen an increase in

the participation from both career and volunteer members of urban and rural municipal fire brigades. This is certainly a positive development, as with so many industrial fire responses industrial firefighters find themselves working alongside municipal firefighters responding from neighboring cities and townships to address a myriad of industrial related fire response scenarios.

As mutual aid relationships include more and more municipal personnel, a natural benefit of industrial emergency training opportunities – such as the XTREME Industrial Fire & Hazard Training event – is, first of all, a greater understanding by municipalities of the industrial related infrastructure found in their response vicinity and the emergency contingencies related to them. Storage terminal and loading facilities, pipelines, dockside marine facilities can be found in rural settings throughout North America. Refined chemical products, pressurized gasses, and other industrial related products are shipped domestically and internationally across highways, rail, and marine passages at all points along the products' economic life cycle. It is only fitting that municipal and industrial fire response professionals train together

and forge better skilled personnel and more efficient strategies for any given response scenario found in their region.

The expanding relationship between industrial and municipal response organizations is instilling a broader understanding of various industrial fire emergency scenarios and the specialized response tactics that should be applied respectively. Structural fire response tactics and pressurized gas fire response tactics are vastly different. Only exposure to – and specialized training for – such an event will prepare response personnel adequately.

During the the XTREME Event Industrial Firefighting specialists with Williams Fire & Hazard Control, ANSUL, Elkhart Brass, E-ONE, Hayden & Co, Niedner, and representatives from facilities throughout industry direct both classroom and field presentations to acquaint participants with industrial related fire characteristics, apparatus operations, incident response logistics, incident command, pre-planning, foam applications – and so much more! Case studies drawn from Williams Fire & Hazard Control's 26 years and 160+ successful industrial responses are used to call attention to various tactics that are unique to industrial response scenarios.

Of course the moment everyone looks forward to . . . putting the classroom dialogue to action on the fire field! The XTREME event is hosted at the B.E.S.T. industrial fire training complex in Beaumont, TX. Live fire rotations include process unit, pipe rack, pump seal, and a multi-level full industrial complex fire simulation.

Over the last 26 years Williams Fire & Hazard Control has applied high expectations to the equipment and the foam chemistry it relies on to attack the fires their response teams see in the field. The large volume water movement tactics they employ have driven the design and manufacture of their own specialized line of apparatus such as the Ambassador 1 x 6 gun, the Battler 2 x 10 gun, Transportable 6,000 gpm pumps, and an entire line of ATC-AFFF foam known as ThunderStorm®. One of the great advantages of attending the XTREME training event, is that these resources are used in field briefings and instruction, and are applied to the live fire training scenarios getting participants up close and personal with large fires and large weapons!

New tactics, new equipment, new knowledge of industrial assets and respective industrial fire emergency scenarios, new relationships between industrial and municipal response organizations are all counted amongst the benefits of Williams Fire & Hazard Control's XTREME Industrial Fire & Hazard Training event.

IFF



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Williams Fire & Hazard Control Inc

Tel: (1) 409 727 2347

Fax: (1) 409 745 3021

Website:

www.williamsfire.com

Darley – A Family's Passion Since 1908

For almost a century, W.S. Darley & Co. has been dedicated to serving the world's Fire and Emergency Services. From their corporate headquarters in Melrose Park, IL, this company maintains manufacturing operations in Chippewa Falls, WI and Toledo, OR, and sales offices in Australia, New Zealand, and China.

They remain a family owned and operated business committed to customer service and their employees with nine third generation family members currently in the business. Company operations are overseen by the executive team consisting of third generation family members Jeff, Paul and Peter Darley.

This company is committed to customer satisfaction – and it's not just lip service. From ads that feature family member's home telephone numbers to core values that reward employees for erring on the side of the customer – this company is

This company is committed to customer satisfaction – and it's not just lip service.

dedicated to excellence. Couple this culture with a diverse line of quality products with progressive design, manufacturing and distribution – it's no wonder this once small family business has grown into an International powerhouse with several different divisions.

EQUIPMENT DIVISION – The Darley equipment catalog is often referred to as the Bible of Fire Service. If you haven't seen a copy of this, chances are you're new to the fire service. The 2006 fire catalog includes over 125 new items, with even more being added to our website www.edarley.com.

PUMP DIVISION – Whatever your fire fighting needs, Darley has the right pump to do the job. They offer the widest variety on the market – from portables, floating, CAFS, PTO, engine driven, front mount, and midship pumps with flows from 60 to 2500 GPM and pressures to 1200 PSI. All Darley midship pumps are UL ratable and meet NFPA requirements. Darley was the first pump manufacturer to receive ISO 9001 certification.

Darley combines its unique strength as a builder of both pumps and apparatus by offering a line of pump systems. A wide variety of pump modules are available including top and side operated, midship and PTO driven pumps. The ergonomic systems can include "Vision Series" panels complete with "one touch controls". Let them design a System Solution tailored to your specific needs.

Compressed Air Foam Systems (CAFS) provide superior firefighting capabilities offering quicker knockdown and improved personnel and structural protection. Darley's AutoCAFS compressed air foam systems are the choice of informed firefighting professionals across the country and around the

world. Engineered for simplicity and performance, these systems are known for their reliability and high quality.

ODIN FOAM DIVISION – Odin Foam was acquired by Darley in 1997 and is a world leader in Compressed Air Foam Systems (CAFS) research and development. At Odin, they produce a wide range of reliable CAFS. Odin is one of the oldest and most experienced manufacturers of Compressed Air Foam Systems.

APPARATUS DIVISION – Darley offers a full range of apparatus, including mini-pumpers, tankers, commercial and custom pumpers. Darley is known for building specialized apparatus that often include CAFS and co-polymer bodies. These features are evident in Darley's premier program series apparatus, which is called "the firetruck". You can expect an unmatched level of quality and service from Darley's entire line of vehicles.

POLYBILT – In 2001, Darley partnered with ProPoly Inc. to form Polybilt LLC. Polybilt has been manufacturing the latest state-of-the art truck products and bodies for the fire truck market and is positioned to provide a variety of products for the commercial truck market as well. Polyprene™ provides for years of trouble-free service life and will not rust or corrode. Also, unlike other materials such as aluminum and steel, our material will not ding, dent or crack.

SERVICE AND SUPPORT – Darley's engineering staff includes certified and professional engineers. They utilize the latest in Computer Aided Design (CAD), and Computer Aided Manufacturing (CAM) to ensure that all manufacturing designs are completely incorporated within the manufacturing process.

Darley's engineering staff includes certified and professional engineers.

Their dealer and service network consists of over 200 U. S. distributors in all 50 states, and more than 50 International dealers located in over 40 countries. Parts and service are also directly available from their plants with the convenience of toll-free numbers – shipping most replacement parts within 24 hours after receipt of order.

Contact us

Trust since 1908. After almost 100 years, you can still talk to a Darley.

IFF

For more information contact:

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IL 60160 USA

1051 Palmer Street

Chippewa Falls

WI 54729 USA

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Derbyshire Fire & Rescue Select Bristol Care™ PPE Managed Care Service

Over 800 more UK firefighters have recently been covered by the PPE lifetime managed care service provided for the UK's fire & rescue services by BRISTOL CARE™ under a contract recently signed between Derbyshire Fire & Rescue and Bristol Uniforms.

Derbyshire have been long time users of Bristol's firefighter clothing. This contract provides for the regular tracking, inspection, washing and repair of the Wessex Bunker Style fire coats and trousers worn by the 485 full-time and 360 part-time firefighters in the County's fire & rescue service.

Bristol Care™ collect the PPE from all 31 of the fire stations across the county



every Monday, take them to Bristol for the inspection and care programme, after which they are returned to the originating station the following Monday to their assigned firefighters. The computerised barcoding system allows each individual garment to be identified with its wearer and provides detailed reporting on its condition, wash and repair history.

Philip Tasker, Bristol Uniforms' UK Sales Manager explained, "Derbyshire Fire & Rescue have been a customer for many

years and have become increasingly aware of the responsibility the brigade has for ensuring the lifetime integrity of their PPE which has resulted in the decision to outsource this service to us. Derbyshire Fire & Rescue bring to 15 the number of fire services which have now adopted the Bristol Care™ managed care service since it was launched in 2000".

Yvonne Duchar, Derbyshire's Procurement Officer, who approved the letting of the contract added, "It is our responsibility as an employer to ensure that we place top priority on the safety of our employees and that means maintaining the integrity of the PPE our firefighters wear. As manufacturers of fire clothing Bristol Uniforms has the capability to wash, repair and decontaminate PPE within a tightly controlled system, which our previous provider could not. With a cleaning and repair service with a 7-day turnaround, and which utilises a barcoding system to log and record every item of PPE and link it to its correct location, I no longer spend so much time investigating the whereabouts of 'missing' fire kit".

For more information about Bristol Uniforms or Bristol Care™ please contact either:

Roger Startin, Bristol Uniforms Ltd
on 0117 956 3101 or email
roger.startin@bristoluniforms.co.uk
Or Richard Storey, RSL Associates
on 01749 870652 or email
richard@rslassociates.co.uk

Standards of Safety and of the Working Environment.

JOIFF welcomes interest from Organisations who wish to become Members – contact the JOIFF Secretariat, details on the JOIFF web site at www.joiff.com



JOIFF the Organisation for Emergency Services Management

JOIFF is a grouping of Organisations represented by their Hazard Manager – or equivalent position – and one nominated Deputy. Full Members of JOIFF are Industrial/Commercial Organisations that have nominated personnel as a Hazard Management Team/Occupational Firefighters/Emergency Responders and Corporate Members are Organisations which do not comply with the requirements of Full Membership but which nonetheless wish to associate with and support JOIFF.

JOIFF aims to fill the information vacuum that exists in the Industries represented by its Members, by sharing valuable information through its Shared Learning email cascade amongst all its Membership and to work to ensure that Members benefit from the misfortunes of some to ensure that the same mistakes are not repeated.

Through its Training Standards Committee, JOIFF has developed a series of Training Courses which it has accredited. Courses are specifically directed at Fire Safety/Emergency Response Staff in Industry and they are carried out at both

JOIFF approved Training Establishments and in Modular form on Company sites under the supervision of JOIFF approved Instructors. Courses are audited to ensure that Training is consistent with the agreed JOIFF syllabi, Site and Instructor requirements. A copy of the JOIFF Training Policy is posted on the JOIFF website.

JOIFF publishes a quarterly Newsletter called The Catalyst which includes information submitted by members as well as other information relative to the on going activities of JOIFF. All copies of The Catalyst are posted on the JOIFF website. JOIFF also organises Seminars and Workshops on subjects of interest to JOIFF Members. The JOIFF website is regularly updated with matters of interest to Members. Each Member receives a Membership Directory and through this, Member-to-Member contact takes place.

JOIFF comments and makes submissions on the nature and control of Safety issues in High Risk Industry such as Fire Risks, Training Competences, Standardisation, Legislation, Codes of Practice etc. with a view to improving

Water, Fire and Aire



An internationally-renowned specialist rescue company can now decontaminate vehicles as big as a jet fighter.

The Aire Group – already well-known as an official supplier of urban rescue equipment to the UK fire services – has designed a special inflatable building that can be used with vapourised hydrogen peroxide.

VHP has been used for years to sterilise medical equipment inside hospitals, but pioneering work by the Aire Group means it can now be taken to the outside world on a vast scale. It means that vital equipment – including fire appliances – can be sterilised if they become contaminated instead of being destroyed or buried. This will save millions of pounds.

VHP is effective against anthrax, TB, e-coli, salmonella, influenza, botulism, legionnaires disease, the killer hospital bug MRSA and even smallpox.



This amazing photograph shows a jet fighter being decontaminated in a specially-designed Aireshelta



An Aireshelta and Airelight in action near the scene of a rail crash

Aire Group first became famous for its tough inflatable buildings which have become a familiar sight at disasters worldwide ranging from the Selby train crash in England through to the vast clear-up after the terrorist outrages in the USA on 9/11. The company's award-winning Aireshower technology to decontaminate rescuers was used at Ground Zero and has now been developed further into a mass decontamination system.

A special Airtight Aireshelta has been developed for fire services. This can be inflated in a minute or so using a BA cylinder and does not need a constant airflow to stay inflated.

The Aire Group is an official supplier of Paratech equipment to UK fire services including airbags, struts and method-of-entry tools.

The company – based in Yorkshire, England – also has the amazing 'sandless' sandbags. These are bags that fold up when not needed so can be easily stored in their thousands. Traditional

sandbags take up masses of storage space and deteriorate over time, but the Aire Group bags can be quickly taken to a flood scene and filled with water so they expand into waterbags as effective as sandbags.

The Aire Group's inflatable pathway saves trapped victims from frozen lakes, coal slurry sites, tidal estuaries, mud banks and water and can be quickly inflated using a standard 1800-litre BA cylinder.

Another nifty invention is the Airelight – an inflatable light that reaches up into the sky and is powered by its own inbuilt generator to provide massive scene illumination.

The Firexpress system available through the Aire Group is so compact it fits into the back of a car or even onto a motorbike yet can be used to douse blazes including car fires, rubbish fires, grass fires, complex fuel fires and even house fires. Many English fire and rescue services are now using it on a wide range of vehicles. **IFF**



Paratech urban rescue equipment in action

For more information go to:
www.airegroup.com
Email: info@airegroup.com
Tel: 00 44 (0) 1484 646559

Safety Showers Experts Receives Queen's Award



Hughes Managing Director Tony Hughes receives a commemorative, hand-made crystal bowl from the Lord Lieutenant of Greater Manchester, watched by the Mayor of Stockport, Councillor Peter Burns, and the Mayoress, Mrs Margaret Burns

During a ceremony at the company's Stockport factory, HUGHES SAFETY SHOWERS has received the Queen's Award for Enterprise International Trade from the Lord Lieutenant of Greater Manchester, Colonel Sir John Timmins. The company supplies emergency safety showers, eyebaths and decontamination equipment.

Managing Director Tony Hughes expressed his personal pride in winning such a prestigious award but emphasized that it had been a team effort. From 2003 to 2005, export sales increased by almost 150%. The growth in business came from countries where Hughes is already well established and from new markets targeted by the recently expanded sales team. The appointment of an export manager, technical manager and the company's first marketing manager has introduced new skills and experience.

The company's Germany subsidiary, Hughes Notduschen GmbH, has played a pivotal role in expanding European business.

Opening offices in North America and the Middle East earlier this year has further strengthened the company's position internationally.

'The choice of products has played a key role in our success', says Tony Hughes. 'We've developed a particularly wide range and created showers and eyebaths specifically for overseas customers. They can be dispatched as sub-assemblies to

minimize shipping costs and then easily built on site. The export range also takes account of local conditions and includes emergency showers and eyebaths capable of operating in extreme climatic conditions – from the arctic to the desert.'

In addition to emergency safety showers and eyebath/facewash equipment, Hughes also supplies a wide range of decontamination systems to the military, fire service, ambulance and civil defence organisations.

The company has pioneered the development of compact, lightweight portable showers for decontaminating emergency services personnel and large transportable systems for the mass decontamination of the general public. A variant of the company's CUPOLAdcon 2 is now the British Fire Service standard decontamination unit for use in case of chemical spillages or chemical, biological, radiological or nuclear incidents.

'Winning the Queen's Award is a great achievement,' says Tony Hughes. 'We now look forward to building on this success and taking the company to even greater heights.'

More information from:
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First response unit gets makeover for a+a

New PPS inflatable has many new features

A complete make-over of their inflatable DPI first response unit, designed for the swiftest and most effective decontamination of suited personnel at the scene of an incident, is one of a range of new products to be introduced by PROFESSIONAL PROTECTION SYSTEMS for 2006.

The original unit introduced over a decade ago is now in service with emergency services in 60 countries. This year's new design incorporates many features that are the result of the evolution, springing from practical experience, the unit has undergone in this time.

The new design is much more rigid than the average inflatable enjoying a separate ground sheet and heavy-duty guy ropes and pegs for extra stability. New features include both a disposable containment as well as a disposable integral water system.



A whole range of optional extras are available on the new unit. A spray gun, for instance, as an alternative to a brush. The unit can also offer detergent injection and a hot water supply. Raised and internal flooring is also available and can be provided with extra safety features like internal lighting and hand-rails.

Also on the basis that ultimately equipment of this kind is only as good as the people who are trained to use it the unit also offers its own training liners.

With the environment in mind PPS have also designed their new unit for minimum water usage, with its special low flow high pressure jets, and despite its greater sophistication than any PPS first response unit to date two people can still deploy it in just two minutes.

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Tel: 01908 272240
Fax: 01908 371605
Email sales@ppsgb.com
Website: www.ppsgb.com

TIPSA – quality is a must



TIPSA is one of the oldest manufacturers of rubber hose in Europe. The Spanish company established in the early 1950's, is recognized in the hose industry, as a high quality rubber jacketed reinforced layflat hose manufacturer, always facing new product developmental challenges, with high reliability. Quality is a must in TIPSA products.

TIPSA has expanded in the international markets after leading the Southern European market for over 30 years. Francesc Colome is running the International Business Division of TIPSA.

IFF: What are TIPSA's targets for the immediate future?

F. Colome: TIPSA is already present in the international market with its own diverse and widespread distribution network, targeting the fire-fighting and the industrial markets. The long-term strategy in the Company is to open new distribution channels, following new market trends and product needs. TIPSA maintains the need for user proximity to fulfill their new developmental needs. Other words, service is first for us.

IFF: How did you manage to maintain the lead in the South European market for so many years?

F. Colome: I'm not really the right person to answer this question, since my scope is worldwide, beside the Spanish original market. It is being managed by other Directors because of their importance in this business for TIPSA Group companies.

IFF: Anyhow, you will probably know the key to success in keeping this leadership in the market.

F. Colome: TIPSA has always and continues, to do its best efforts to bring to the market not only products, but also full end user solutions: hose, couplings, reels, deployment systems, trailers, etc. The ongoing investment of R+D with new materials and innovative products is certainly one of the successes in our industry. To be able to adapt our company structure to new distribution networks is also a must today to keep our edge on the market.

IFF: TIPSA was the pioneer in Europe, offering the nitrile jacketed rubber extruded hose and other products: OROFLEX™, ARMTEX™, JAFRIB™, JAFLINE™, RYLBRUN™, BLINDEX™, JAFX4™, VIPER™, BLUE DEVIL™. What is your company working on now?

F. Colome: Our R&D experts are spending most of their time researching and developing new products and investigating market needs, while offering new solutions. This challenge is in a constant state of change, with new requirements and needs daily.

Our newest product is a 12" (300mm) extruded through the weave layflat rubber hose, 4 years in the making. I'm proud to say, TIPSA is the only worldwide manufacturer able to offer a high quality large volume flow rubber layflat hose in 200 meters one length. Only a Company with massive experience and a full market commitment can afford such a product today. Superior knowledge of the raw materials, yarns and manufacturing process allows

TIPSA to offer this product now a days with full warranty for the end user.

IFF: Is there really a market need for a 300mm rubber diameter layflat hose?

F. Colome: Yes. Personal security in high risk factories need a high volume water supply with minimum supply time. Traditional steel pipe systems are very expensive because they have to be extended throughout the factory premises. Imagine an oil refinery and its dimensions. A small fire can become a big and dangerous one in a few minutes with the severe human loss and insurmountable structural cost as a consequence. Our layflat hose with, proper equipment can supply 20,000 liters/min and most importantly, can be moved from one side to the other in minutes with a truck or helicopter, pumps included.

Imagine the lives you can save and the costs!

IFF: You talk about human risk. Isn't it a risk to handle a 300mm diameter hose in 200 mtrs?

F. Colome: You are right. This product is serious business. Our business is to manufacture the hose, what we are able to do in the best way. However, we offer our hose to OEMs who specialize in safety equipments and develop the proper solution. No one can handle a 200mm, 250mm or 300mm diameter hose (8, 10 and 12") in 200 mtrs (660 ft) without equipment. A hardware-engineered solution has to be in place to take maximum advantage in the shortest time to our product. We are facing the emergency safety market with this product. So we provide an argument to industry engineers to develop new solutions for the safety industry to handle our hoses.

IFF: Is the only market emergency safety for your big diameter hoses?

F. Colome: Of course not. This is only one application. From de-watering to sewer pipe bypasses under construction are only examples. Don't forget about the big water rains in Louisiana, US or the big water flood in Central Europe or Asia in the last summer. There is no application limit with our rubber jacketed big diameter hoses. Any application which needs high volume water flow with an excellent physical adhesion resistance with no delamination is a potential user of our hose. A user looking for a high abrasion resistance product with low dilation will be more than satisfied with our rubber layflat hose.

IFF: Thank you very much for your information and time and we do appreciate very much TIPSA's contribution to the safety industry with your new developments, which we are sure will show a new trend in this particular market again.

IFF

For any additional
information go to:
www.tipsa.com

Polycom Mobile Responder –

Delivers Portable Video System for Field Use by Government, Education, Healthcare Professionals

POLYCOM, INC. (NASDAQ: PLCM), the world's leading provider of unified collaborative communications solutions, today announced the availability of its Mobile Responder™ video conferencing system for first responders, emergency management, Homeland Security, police, firefighters, human services departments, educators, and healthcare professionals. The Polycom Mobile Responder is a rugged, compact, easy-to-use, transportable video conferencing solution with a built-in display, camera, microphone, and speaker that will greatly improve field communication.



Polycom's Mobile Responder is built tough for video communications in challenging field environments

Designed to remove the physical barriers to video conferencing and enhance the overall communication experience, the Polycom Mobile Responder transportable video conferencing system meets – and exceeds – the most demanding requirements. The Polycom Mobile Responder is a high-quality, durable, wheeled unit that meets FAA guidelines for carry-on baggage on commercial airlines, and is easy to move and set up.

"Natural disasters and emergency situations require immediate response and improved communications," said Mark von Sponeck, executive director of Global Nomads Group, a non-profit organisation whose mission it is to bring the world's youth together over video conferencing, no matter how remote the location. "As a beta tester of the Mobile Responder, we have had the opportunity to use it in remote locations in the field. Through the use of Polycom's mobile video conferencing unit, even emergency personnel who need to communicate quickly from a field location now

MFC Equipment to be used in Water Rescue training

MFC SURVIVAL has donated water rescue equipment to Outreach Rescue at Bangor, North Wales. The products will be used on vital water rescue training courses.

The equipment includes a Rapid Response Shelter which does not need continuous inflation. It is to be used to house their equipment onsite and to provide a changing area for personnel during training. Also donated is an All Purpose Inflatable Stretcher. The stretcher is a superior new design from MFC that can be used on land, mud, marsh, open water, ice and snow. A new Water Rescue Sled was also donated, the rescue sled was developed for transferring persons across water or surfaces comprising of mud, snow, water or sand. The Rescue Sled is primarily used in crisis rescues that occur in rivers, flooded urban areas, coastal resorts, mountains and swamps.

MFC Survival has supplied equipment to Outreach in addition to the emergency services for a number of years. "Outreach Rescue were extremely helpful in the development of our waterborne rescue sled. Their analysis of its operating use proved invaluable" commented Alex Austin, Design Consultant for MFC Survival Ltd.



have the ability to do so easily and effectively."

Based on Polycom's top-of-the-line VSX™ 8000 system, the Polycom Mobile Responder comes complete with an extra large built-in display, camera, microphone, IP network interface and AES encryption. When plugged into a projector, it can handle a large room or group conferences.



Tony Griffiths, Director of Outreach Rescue says of MFC Survival's products "MFC Survival equipment has been the subject of extensive field trials with Outreach Rescue training over a number of years. We continue to use their pathways, sleds, stretcher and shelters in numerous applications to maintain product development and can only report the highest levels of performance and durability for MFC products".

Outreach has operated a range of incident response and rescue programmes for sixteen years. They are operated in conjunction with the UK Fire Service College, Moreton-in-Marsh and the Centre for Disaster Management, Coventry University. Their clients include numerous private and public sector organisations, emergency services, universities and colleges.

MFC Survival Limited is one of the world's leading designers and manufacturers of specialised safety and survival equipment. With over 40 years of experience, the company is renowned for producing the highest quality product.

For further details please contact:
Frances Hilton,
Marketing Assistant
MFC Survival Ltd
Tel: 07717 203812
Email: frances@mfc-survival.com
Website: www.mfcsurvival.com

With a fast setup time and a form factor that is built to withstand the rigors of travel, the Polycom Mobile Responder is the perfect portable system for rapid deployment applications in any environment.

For more info visit www.polycom.com or call 00 800 00 33 44 55

Draeger – Corporate Overview



Innovation is the theme that runs throughout Draeger Safety, manufacturers of a wide range of respiratory protection and gas detection systems for use in firefighting and industrial applications.

Founded in 1899 and employing over 350 people in the UK, Draeger believes that innovative forward thinking and a strong customer focus are central to its success. These core principles allow the company to remain faithful to its values, respond to the requirements of the market and meet customer needs for protection and safety.

Offering pioneering solutions from the development of the first carbonic acid pressure reducing valve by Heinrich Dräger in 1899, to the DraegerMan PSS range of Compressed Air Breathing Apparatus around 100 years later, Draeger Safety has never lost sight of the need to meet customer requirements. The development of the revolutionary DraegerMan PSS Merlin Telemetry system which allows up to 12 firefighters to be monitored from outside an incident bears testimony to that, as does the latest range of innovative Draeger X-am personal gas detection instruments which are as small as a mobile phone.

In fact, by working closely with its customers and understanding the complexities of hundreds of very different applications, Draeger Safety has been able to develop products that not only meet the needs of today's users but which can be further enhanced to meet the needs of the future.

Technology scouting and joint studies with scientific institutions also ensure the ongoing identification and monitoring of relevant fields of technology.

This philosophy of Pioneering Solutions has ensured that the company never loses sight of its goal – creative design, high quality performance and practicality in use.

Every year, Draeger invests around five percent of its sales revenue on research and development. In addition, the sophisticated in-house research department continually works with different engineering and scientific disciplines in a variety of national and international projects. Technology scouting and joint studies with scientific institutions also ensure the ongoing identification and monitoring of relevant fields of technology.

This international approach has also led to the development of more and more products that are specifically designed with the user in mind. For instance, extensive work studies with the

Rotterdam Fire Brigade led to improvements in the ergonomics of compressed air breathing apparatus whilst both on and offshore gas detection systems have been significantly enhanced by studying customer feedback.

Providing a comprehensive selection of products and systems solutions for every conceivable customer requirement, each of the Draeger products combine ergonomics and wearer comfort with user safety and a modern, practical design. They are also designed to be cost effective, durable and easy to use.

Today, Draeger systems can be found in a wide range of industries from construction, firefighting and freight through to mining, oil and gas, petrochemicals, process control and water and waste treatment.

Whether protecting against dusts, gases and vapours, chemical attack and other atmospheres that may be hazardous to health or where life cannot be sustained, the Draeger range has something for everyone.

In 1930, for instance, Auguste Piccard was the first person to fly into the stratosphere in a light metal balloon using Draeger apparatus and Draeger oxygen equipment was used by Sir Edmund Hillary and Tenzing Norgay when they became the first people to conquer Mount Everest. Marine researcher Jacques Cousteau has also relied on innovative Draeger technology back in the 1950's.

Today, Draeger systems can be found in a wide range of industries from construction, firefighting and freight through to mining, oil and gas, petrochemicals, process control and water and waste treatment – wherever, in fact, a potentially airborne hazard may exist.

Fully supported with the Draeger Total Care programme which combines cost efficiency with ease of mind, the range includes half-mask and full-face masks, powered air purifying respirators, compressed air breathing apparatus, personal escape systems, electronic monitoring units and telemetry systems. Portable gas detection instruments, fixed gas detection systems and chemical protection suits are also included, as are alcohol breath test systems and diving apparatus.

IFF

Further information is available from:
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FDIC Announces 2007 Dates

Plan now to attend FDIC, the largest instructor/training fire event in the United States, April 196-21, 2007 in Indianapolis, IN USA. FDIC 2006 set a record-breaking year with more than 26,000 people in attendance and more than 900 exhibitors spanning 500,000 gross square feet of exhibit space and FDIC 2007 is set to surpass those numbers.

What sets FDIC apart from other North American fire shows is the focus on training and instructor development. All classrooms and Hands-on Training sessions

focus not on the basics of first responder skills, but on the fundamentals of fire training. This focus allows attendees to learn new skills and technology while simultaneously learning how to take that training back to their respective departments to train others.

FDIC kicks off with its signature program, H.O.T. (Hands-on Training) sessions. Attendees experience, in an interactive training environment, some of the most intense training courses that focus on a range of topics from vehicle

extrication to collapse rescue. Working through challenging situations in real-life settings, H.O.T. attendees experience first-hand the dangers they'll face in their jobs and learn the best way to prepare and safely work in such conditions. Led by leading industry experts in the United States, Hands-on Training sessions give participants advanced knowledge and skills that can easily be brought back to their firehouses to train other members of their departments.

From the H.O.T. training grounds, participants take their hands-on experience and apply it in a classroom setting. FDIC boasts a comprehensive conference featuring more than 120 powerful and pertinent classroom sessions that cover new developments in training, current events in the fire industry, management and legal issues. Taught by the fire training industry's top instructors, classroom sessions provide attendees the information they need to do their job well and safely.

"FDIC addresses the concerns and training needs of first responders worldwide – with seminars that traditionally cover such topics of general interest as response to terrorism, protecting industrial facilities, search and rescue, structural collapse rescue, low-cost training, becoming a better instructor, lessons learned from major incidents, response to natural disasters, rescuing our own, and hazardous materials, to name a few," said FDIC Conference Director Diane Feldman.

FDIC's state-of-the-art exhibit hall allows people to see, up-close and personal, the latest technology, products and services designed for the fire and EMS industries. With more than 900 exhibitors consisting of top-notch manufacturers and suppliers, FDIC attendees can see what is new in the industry and how those products can help their departments. In addition, exhibitors and attendees also have many opportunities to network during exhibit hall hours and special events.

While training and education are the foundation of FDIC, another well-known aspect of the event is the tradition of brotherhood that attendees experience. "Stand alongside fellow firefighters from all over the world who are brought together at FDIC by a common bond – their desire to save lives, protect property, and go home safely at the end of the work shift," said Feldman.

For more information on FDIC 2007, visit www.FDIC.com



Peli expands its Tactical Series with the M3 3370



M3 3370 – The new addition to Peli's Tactical Light Series

PELI™ PRODUCTS, a leading manufacturer of professional torches and high-impact watertight Protector™ Cases is proud to introduce the M3 3370 incandescent task light as a new addition to our Tactical Light Series.

Initially designed for law enforcement and military users, it can be an excellent tool for anyone who needs a compact and bright source of light.

The M3 3370 is 19.1 cm long and is constructed of nearly indestructible CNC machined aluminium, which makes it highly resistant to falls or knocks. It features a no-slip knurled diamond pattern and a tail-cap switch for easy on/off/momentary, one-hand

operation. Powered by three CR123 lithium batteries, it offers an extremely long shelf life and exceptional performance in extreme temperature conditions. Together with its powerful Xenon lamp, the M3 3370 casts 115 lumens of intense light for up to two hours.

The M3 3370 is available in either Black or O.D. Green Type III Hard Anodized finishes. It is supplied with a Cordura® holster and Lithium batteries. Optional accessories include weapon mounts, cap filters and traffic wands.

As with all Peli products, the M3 3370 is covered under Peli's Unconditional Guarantee: **You break it, we replace it ... forever™**

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Holmatro Rescue Equipment

Dutch-based manufacturer Holmatro Rescue Equipment is one of the world's leading suppliers of high-pressure hydraulic rescue tools. With production facilities in The Netherlands and the U.S.A. and dealers in more than 120 countries, Holmatro provides a wide variety of extrication equipment to fire brigades, rescue teams, armies, navies, air force and civil defence units all over the world.



The Holmatro® rescue programme includes hydraulic cutters, spreaders, combitools, rams, door openers, (wedge) jacks, a shoring system, many accessories and assist tools, various pumps and a series of pneumatic lifting bags.

In life saving operations rescue tools should function optimally in any situation. It goes without saying that good product quality and periodic maintenance are of vital importance. Furthermore, rescue tools should be able to offer solutions for the growing diversity and complexity of applications rescuers are confronted with nowadays. As an extrication specialist Holmatro pre-eminently knows and understands the situations rescuers are faced with 'in the field'. We gather information on the latest (vehicle) extrication techniques and exchange this knowledge with rescue training centres worldwide on a continuous basis.

Through the years Holmatro has developed many innovative rescue tools. The most recent example is CORE™ Technology: Holmatro's revolutionary one hose system.

CORE™ Technology

Until its introduction in June 2005 hydraulic rescue tools always consisted of a pigtail (dual) hose system, with a separate pressure and return hose connecting pump and rescue tool. A CORE™ system consists of only one hose: a high-pressure inner hose inside a low-pressure outer hose. The hydraulic principle and tool performance of CORE™ Technology and traditional technology are of course identical. CORE™ Technology ranks with the most important innovations in the field of extrication ever. The benefits for the user of a system which can be summarized as follows: "quick, easy and safe".

Quick

A CORE™ system allows the rescuer to change (disconnect and connect) the tool on the spot, while the hose is under flow and without having to switch the valve back at the pump. CORE™ couplers can rotate (360°) freely on both ends. Therefore it is now possible for instance to unroll a hose while walking away with a connected tool and start opening the tool in the meantime. These CORE™ Technology features result in significant time savings.

Easy

A CORE™ hose has fewer autolock couplers than a pigtail hose and it gets coupled directly at the tool.



This allows you to couple the tool in any position, even when holding the tool in one hand and clicking the hose on with the other hand. The possibility of changing tools while the hose is under flow makes changing over at the pump unnecessary. This results in increased flexibility: with CORE™ Technology a complete rescue set can be operated easy and efficient by just one rescuer.

Safe

Because the high-pressure hose is integrated within the low-pressure hose, it is never in direct contact with the outside environment. These and other safety measures make sure that the user is never exposed to more than 25 bar. CORE™ hoses are reinforced with

Kevlar. Even the most rigorous and prolonged test scenarios have not resulted in any kinking or possible damage resulting from it.

Holmatro® 4000-series

The Holmatro® 4000-series of hydraulic rescue tools is the successor of the very successful 3000-series. The 4000-series holds a number of benefits for the user that lift Holmatro® rescue tools to another level in terms of user-friendliness, performance and working speed. Holmatro's revolutionary CORE™ Technology is standard on all 4000-series tools. However, the 4000-series can also be supplied with traditional pigtail hoses.

IFF

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WATEROUS
Fire Pumps – Since 1886

Waterous Launches Revolutionary Foam Firefighting Technology



WATEROUS COMPANY, a global leader in fire suppression technology, has introduced the Advantus advanced foam system at this year's FDIC Show in Indianapolis. The Advantus, unlike most volume measurement proportioners, uses conductivity technology to deliver a precise ratio of foam and water for more efficient CAFS performance.

"We are changing the parameters on how proportioners regulate foam to water ratios," says Bob Peterson, Sales Manager, Asia/Pacific Region for Waterous. "Unlike volume-based proportioning systems, the Advantus is more reliable, more accurate and more efficient." Using proven conductivity measurement technology to accurately balance foam concentrate with water, the Advantus is able to sample the water and subsequently the foam solution to maximize efficiency. "It optimizes foam usage through sample measurements," says Mr. Peterson. "Regardless of the water supply and foam concentrate being used, the Advantus will make the appropriate adjustment to deliver the most effective and economic foam solution, even in ultra low-flow conditions."

A giant leap forward in foam fighting technology, the Advantus also features more advanced engineering. "The foam pump design allows proportioning of higher viscosity foam concentrates and features a more durable construction that prevents damage from corrosion or impurities in the foam concentrate supply," says Mr. Peterson. "The new proportioner is a revolution in foam fire fighting technology and gives fire brigades the advantage they need to fight difficult fires." Systems will be available in 8.3, 11.3 and 22.7 liters per minute in either 12 or 24v. For more information on the Advantus Foam Proportioner visit www.waterousco.com or www.waterous-australia.com

About Waterous

Revolutionizing firefighting since 1886, Waterous has been manufacturing the most reliable, performance-enhancing pumps, power take-offs, valves and hydrants the fire service industry has to offer.

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New BP Booklet Features Angus Foam Technology for LNG Applications



ANGUS FIRE have announced that BP, one of the world's largest energy companies, will feature Angus' specialist fire fighting foam equipment in a new booklet on extinguishing liquefied natural gas (LNG) fires. Angus Fire is part of UTC Fire & Security, a

unit of United Technologies Corp. (NYSE:UTX).

The booklet, titled "LNG Fire Protection & Emergency Response," is set to become the industry standard on LNG spill and fire protection. It explains the dangers of LNG as well as the special fire hazard management and emergency response measures required in the event of an LNG fire.

"Until now the only fire test data available on LNG has been based on outdated storage and handling techniques," said Mike Willson, Product Manager for Angus Fire. "This new booklet describes modern solutions for realistic operating conditions, and is all the more important because global demand for LNG as an energy resource is growing rapidly."

The booklet's recommendations are based on extensive testing of the effectiveness of different types of foams and application techniques in a range of realistic LNG emergency scenarios. The tests were carried out at the new LNG testing and training facility developed and sponsored by BP in collaboration with the Emergency Services Training Institute at Texas A&M University.

The booklet describes how a good quality

high expansion foam applied at a controlled rate and expansion ratio is highly effective in reducing vapour levels at LNG spills and in achieving rapid and dramatic reductions in the heat emissions of LNG fires.

Only specialist high expansion foam generators and foam concentrates that have been proven to withstand the intense heat of LNG fires should be used, such as the Angus Fire LNG Turbex generator and Expandol foam that are both featured in the booklet.

Company experts recently addressed the LNG Technical Committee at the National Fire Protection Association World Safety Conference in Orlando and the Society of International Gas Tanker and Terminal Operators (SIGTTO) AGM in Athens. SIGTTO is the world's leading LNG safety organization and represents virtually the entire world's LNG tanker and terminal operators.

Angus Fire is also co-operating with Resource Protection International, the independent fire protection consultancy appointed by BP Group Technology to prepare the new booklet, in establishing a new LNG fire training programme for SIGTTO in Europe.

The new booklet is the seventh in the BP Fire Booklet Series ("blue books") and is available from BP International.

For more information please contact:

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Monnex[®] dry chemical powder from Angus Fire



Monnex[®] dry chemical powder from Angus Fire offers unsurpassed fire fighting performance on BCE hazards. Angus Fire is part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit.

Make the First Strike Count

Many industrial fires are fought early on by employees with limited experience in fire fighting. By using high performing Monnex[®] their efforts can be much more effective. When used in hand-held extinguishers Monnex[®] extinguishes fires that lower performing powders require large wheeled extinguishers to address. The use of Monnex[®] can make the difference between a fire being a minor inconvenience and a major disaster.

High Performance

Monnex[®] extinguishes fires by disrupting the chemical reactions that occur during combustion. Based on potassium allophanate, a special complex of bicarbonate and urea, its powder particles break up or "decrepitate" into even smaller particles on exposure to heat. This increases its surface area, which in turn increases its fire fighting efficiency. As a result Monnex[®] puts fires out faster than ordinary BCE powders. In professional hands just 1 kg of Monnex[®] can extinguish a fully involved 144B (4.52 m²) hydrocarbon tray fire. Weight-for-weight no other dry chemical powder offers superior fire fighting performance.

Exceptionally Versatile

Monnex[®] is ideal for use on a wide range of pool, running fuel and pressurised flammable liquid (Class B) fires including hydrocarbon oils, gasoline, diesel and fuel oils. It is also highly effective on industrial flammable liquid chemicals like alcohols,



Monnex in action on a running 3D fuel fire

ketones, ethers and esters, which ordinary dry chemical powders struggle to extinguish; flammable gas (Class C) risks including LNG and LPG; and risks with associated electrical (Class E) hazards.

Recent tests at the new LNG testing and training facility developed and sponsored by BP in collaboration with Texas A&M University Emergency Services Training Institute (ESTI) have proven that Monnex[®] can quickly extinguish medium sized LNG fires.

Monnex[®] is extensively used in high fire risk areas where fast and reliable fire protection is of paramount importance. Typical examples include oil, gas and petrochemical plants; power stations; civilian airports and military bases. Such facilities are increasingly upgrading from ordinary BCE powders to Monnex[®] in their existing powder delivery equipment. These include hand-held extinguishers, mobile trolley units, dry chemical powder skids, specialised dual agent systems and fire trucks.

Global Reach

Monnex[®] is manufactured exclusively at Kirkby near Liverpool in the UK. It is manufactured to the highest standards in accordance with European Standard EN615 (1995) using processes approved to the BS EN ISO 9001 (2000) Quality Management Standard and the ISO 14001 Environmental Quality Standard.

Customer support is provided from Thame, near Oxford, with a world wide network of factory trained distributors. Angus Fire is a UTC Fire & Security Company, which provides fire safety and security solutions to more than one million customers around the world. UTC Fire & Security is headquartered in Connecticut, USA.

IFF



New Angus Fire dual agent wheeled extinguisher features Monnex and Angus Fire AFFF

For further information contact:

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MONNEX[®]

Commentary on the pipeline blast in Nigeria

On 12th May 2006 over 150 people were killed when an explosion took place at a pipeline at Inagbe Beach near Lagos, the former capital of Nigeria. Theft of the fuel was being attempted when the explosion occurred. There have in Nigeria been several disasters of this sort. For example there were in the second half of 2004 two such accidents close to Lagos, claiming between them over 80 lives. In 1998 in Jesse, southern Nigeria over 1000 people were killed through a fire beginning at an oil pipeline. Local residents had been standing close to the pipeline with buckets and bottles to scavenge oil from the pipeline. The fire spread to homes in nearby villages, killing families asleep in their homes.

By J. C. Jones

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In the recent accident at Inagbe Beach the thieves had drilled holes into a pipeline conveying gasoline which therefore gushed out, and they were attempting to fill hand-held vessels with the fuel for sale on the black market. We can speculate on whether there was a significant overpressure or whether all of the deaths were due to the heat. When an explosion is accompanied by an overpressure there are two classes of victim: those affected by the heat and those affected by the overpressure. Usually when this is the case there is

A BBC account of the accident reports that no non-fatally injured victims had been found in the initial examination of the scene.

a large difference between the number of fatal injuries and the number of non-fatal injuries. That at Inagbe Beach there were many fatalities due to heat is clear from descriptions of the accident scene. However, a BBC account of the accident reports that no non-fatally injured victims had been found in the initial examination of the scene, which justifies a tentative conclusion that there was no overpressure (therefore use of the word 'blast' in many of the media coverages is a little imprecise). We might in any case expect intuitively that there would have been no overpressure on the basis that, at the beach setting, there was no confinement of the fuel vapour/air mixture by buildings and structures: such confinement raises the turbulence prior to ignition and promotes overpressure. When a flammable gas is rapidly released through an orifice its momentum entrains air and this too accelerates combustion thereby causing overpressure. In the accident under discussion however the initial leak was of *liquid* which would have lost most of its kinetic energy by the

time it evaporated into the atmosphere and contacted the air in which it burnt. This also supports the view that there was no overpressure and that all of the victims had been killed by the heat alone.

There has been commercially significant production of crude oil in Nigeria for almost 50 years and the country is a member of OPEC. Nigeria is currently the tenth largest oil producer in the world and the seventh largest exporter. Several foreign operators are active there. There are four oil refineries in Nigeria but these have operated inefficiently through factors including sub-standard management and corruption, therefore Nigeria has to import refined petroleum material. There is an export terminal for crude oil from the Niger Delta which recently has been entirely out of operation because of the bombing by militants of an offshore platform within the Niger Delta, the sabotaging of two pipelines and the abduction of nine expatriate workers.

There are four oil refineries in Nigeria but these have operated inefficiently through factors including sub-standard management and corruption, therefore Nigeria has to import refined petroleum material.

Such social and political instabilities have had very serious effects on Nigeria's oil industry. Environmental responsibility has not always been evident and damage from oil spills, from excessive flaring of gas and from the sabotaging of oil pipelines, has been extensive. Legitimate complaint to the government has at best been ignored: at worst it has led to reprisal in the form of a death sentence.

IFF

MUNICIPAL



Pic courtesy of Reuters



I've got the look.

[EVOLUTION® 5200 – New Thermal Imaging Camera]

With best image quality, ergonomic design, robust components and extreme durability, the EVOLUTION® 5200 camera sets new standards in thermal imaging.

The new sensor with increased sensitivity in the Low Sense Mode creates thermal images in a quality never achieved before.

The revolutionary Heat Seeker PLUS technology with color pixels ranging from light yellow to dark red indicates changes in structural temperature and reveals the intensity and direction of a fire. An unique shutter indicator tells the user when an automatic recalibration is taking place. Get yourself the best look. Contact us for more information.



High Sense Mode: Highest sensitivity



Low Sense Mode: Widest temprange



[Your Safety. Our Mission.]

Odin Foam "Kodiak",
engine driven CAFS unit



Why CAFS is Ablaze Around the World

The oldest reference to a Compressed Air Foam System of which I'm aware dates back to October 1938, when the London magazine, *The Fireman*, reported on what was colorfully called The Pneumasuds. It was installed by Merryweather onboard the British Trinity House vessel *Patricia* and was said to operate quite remarkably. Unlike modern systems, it was totally manually controlled. That would have been state of the art for that time period, and it was perfectly logical for a crew that could train regularly with the equipment.

By Mike Ruthy

VP Engineering,
W.S. Darley & Company,
Pump Division

Obviously, the superior fire-fighting capabilities of CAFS were already known by that time. Most firefighters nowadays would view the operation of these units as being simply too difficult, and they would be absolutely correct.

Compressed Air Foam Systems, for those new to the fire service, are systems designed to enhance water's fire extinguishing properties. These systems use water, air, and foam concentrate to create a totally new fluid, with vastly different properties from plain water. This new fluid is called finished foam.

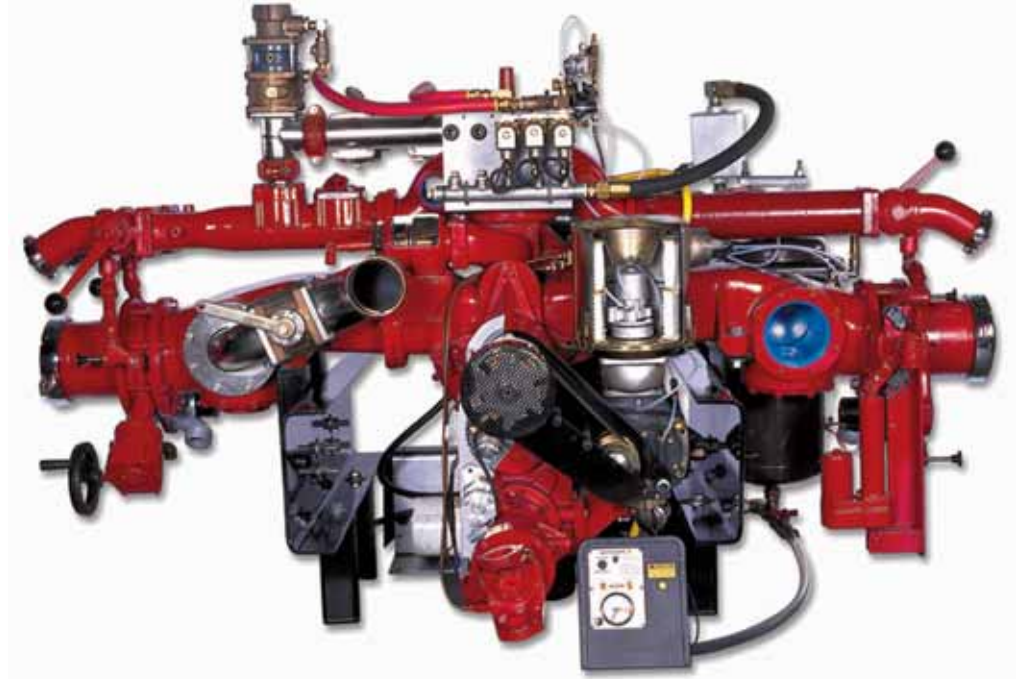
Finished foam is more effective than water in many ways. One can discharge a fog pattern or a stream, but it's still water, with limited properties. Water has a relatively high level of surface tension,

for instance. This surface tension causes the water to bead up and roll off of many surfaces. There are studies showing that up to 90% of the water applied to a fire simply flows off, contributing little to the cooling effect that is desired.

Finished foam, on the other hand, clings to the fire's fuel. Its lower surface tension allows the water to penetrate the fuel, as it can enter smaller pores in the surface. It remains in contact with the fuel until it evaporates off, which provides the most effective cooling. Heat removal by evaporation (steam) is several orders of magnitude more effective than by conduction (warming).

An additional problem caused by having plain water run off is that one cannot see which areas are protected and which are not. Using a

*Darley "LDMBC",
midship mounted,
split-shaft driven
CAFS unit*



compressed air foam system, the bubbly mixture is easy to see, and the nozzleman can apply the foam where it is needed, further improving the effectiveness of his attack. There is no water or time wasted in providing exposure protection to surfaces that are already sufficiently damp.

Exposure protection is another area where CAFS wins hands down. Most compressed air foam systems allow the user to choose between a wetter foam, one suitable for direct attack, and drier foam, one that can cling to vertical surfaces or even the bottom of horizontal surfaces such as ceilings or porches. Try doing that with plain water.

Finished foam can also fight fires in another way water can't – by cutting off the fire's air supply. A blanket of foam can smother a fire at the same time it cools it, separating the fuel from the air. This also reduces rekindles and improves mop up operations.

Water has other properties that reduce its effectiveness. Water is heavy. Large plain-water handlines are hard to move around. Handlines flowing finished foam are so light that they float, reducing fatigue and decreasing deployment time.

All these properties have been proven, and numerous tests have shown, time and again, that for a given amount of water, CAFS produces a superior fire-fighting stream. Most studies have shown CAFS to be about 8 times more effective than plain water. Those studies were performed under controlled burn operations, and that's where they fail to make the point. Firefighters hear this "8 times" figure when they read or hear about CAFS, and I do not believe they realize or fully understand that number is actually a minimum figure. It is a number from the laboratory under controlled conditions.

It's good to do experiments to quantify technologies. We do them all the time at Darley, as do the other CAFS suppliers, I presume. If a pallet fire can be put out in 1/8th the time using 1/8th the water when using CAFS versus plain water, then there is a number we can use. If you have a struc-

ture in a wildland area that you can coat with finished foam and that saves it, versus dowsing it with water that ineffectively runs off, and the structure is subsequently lost...well I challenge anyone to put a number on that. It's certainly a bigger number than 8.

There can be multiple goals in every firefighting exercise, with different tools required to meet those goals and different costs to using those tools. Compressed Air Foam Systems certainly have a higher initial cost, but they will actually save most communities money in the long term. Each community pays for their fire service in a variety of different ways, some departments rely on volunteers and donations, others are sponsored by local, state, provincial or federal governments. All departments should strive to provide the best service they can with the money in their budget. I encourage all fire chiefs to share this article with their budgeting boards and their communities to help them understand why this technology will provide better protection at a lower price.

Most departments begin skeptical that CAFS is the lowest price option, and for good reason: a compressed air foam system has upfront costs twice or three times the cost of a plain water pump, when ordering a new truck. Let's spell out the ways the community benefits with this technology in ways they can understand.

The department obtains a new tool for firefighting that allows them to extinguish fires faster, with less water damage and runoff. Departments already using Class A foam will see a marked reduction in concentrate usage, enough to justify the cost of the compressed air foam system outright. Law enforcement agencies benefit from the easier arson investigations, as evidence is less likely to be washed away with a CAFS suppression. Local governments benefit from lower risks for firefighter injuries due to fatigue. On these bases alone, the case is fairly strong.

My current pet peeve is that, at least in the United States, our insurance agencies have not encouraged this technology, with the state of

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Odin Foam "AutoValve", one button CAFS controller

Texas being a notable exception. One does not need to be a high-priced lawyer to realize that if communities embrace a technology that will result in fewer and smaller claims over fire damages, the insurance companies are one of the main beneficiaries. In most of the US, at least, communities get no incentive from the insurance industry to adopt compressed air foam technology. I think it is high time that should change, though I fully acknowledge that insurance underwriting is a complex subject and is not my specialty. Even without insurance incentives, many communities have discovered the evidence that suggests a change to CAFS is compelling.

In water scarce regions, CAFS has taken off like wildfire, if you'll pardon the pun. When there is little access to water, doing the most with what water you have is self-evident, and most CAFS sales in the US are for the wildland and urban interface areas. In other parts of the world, though, CAFS is just getting started. South Australia Brigade took delivery of their first CAFS unit last year, for instance. They have reported excellent results, so I'm hoping the introduction of CAFS units there will increase. That's an area where CAFS would be a considerable benefit. In New Zealand, CAFS has been embraced, even more warmly, and on a major scale, with over 65 vehicles in service since the introduction of CAFS there in 1996. Many of these vehicles are in rural settings, but many are also in urban areas, utilizing larger Scania chassis. South Africa is another country where departments are experimenting with CAFS and reporting great results. Talk about some wildland settings!

Many municipal departments are taking up CAFS as well, even towns with no or with little urban interface. That is the largest market for the majority of the vehicles we make in our Apparatus Division as opposed to our Odin Foam division, which serves the wildland market, primarily. We each make different kinds of systems, depending on the needs of our customers, as do our other competitors in this field. For instance, in wildland settings or areas where departments want pump and roll capability, nothing beats the versatility of a unit with a separate engine. For departments where pump and roll isn't as important, a PTO driven unit might be sufficient. Of course, if pump and roll isn't important at all, a midship mounted, splitshaft driven system would then become an option.



Darley "CAFS Commander", CAFS control with safety interlocks

Besides looking at how a system is driven, a department should also consider how large a system to purchase. For larger trucks, 120 CFM to 225 CFM units are the most popular. 120 CFM can run a deck gun, a 2.5" (65 mm) stream, or two 1.75" lines (45 mm), while the 225 CFM units have nearly twice the capacity. This can be some very impressive firefighting power.

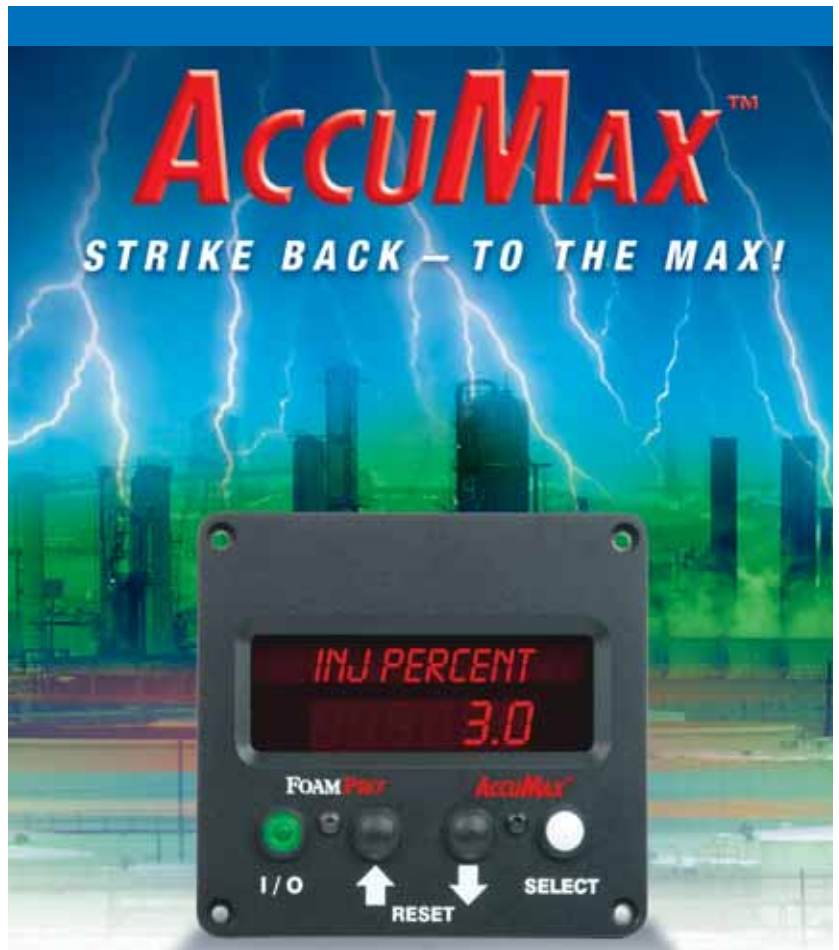
More important than just sheer air volume are some other factors. Ease of operation is an area to scrutinize. While older units ten years ago required a lot of adjustment, modern systems can literally be set at the touch of a single button. Simplicity of operation reduces training time and provides for the utmost in operators' confidence, allowing them to focus on the more pressing needs of the scene.

The other area on which to focus is safety interlocks. Not all systems provide the same level of protection for the fire fighter and for the equipment that have been identified as desirable. Systems should protect against slug flow, a potentially dangerous condition that can arise when foam concentrate flow is disrupted, resulting in water and air exiting the nozzle in violent spurts. Overheating, overspeeding and overpressurizing the compressor must also be avoided. A lesser understood fact is that the compressor should not be started up under load, or before the compressor's oil can properly drain to its sump after a shutdown. Timing circuits and pressure circuits should be installed to prevent damage should the operator call for engagement at an improper time. Different manufacturers attempt to accomplish these goals in different ways, and it is important to the Fire Department to determine whether they consider these approaches the best practice.

In the end, it's important to remember that CAFS has proven to be one of the most effective fire-fighting tools ever developed for most situations. We fight fires to limit property damage and mitigate injury and prevent deaths. When viewed in this light, it's hard to imagine that a community would not want to have their firefighters equipped with the best tools available to achieve that end, especially tools that are arguably an order of magnitude more effective.

In the US, it is said that the fire service adopts change quite slowly. That has certainly been my experience in my 20+ years of involvement. And there is a very good reason for a cautious approach to new technology in our field. But CAFS is proven effective, and as the *Patricia's Pneumasuds* has shown, it's a technology with a lot of history.

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Picture courtesy of
Bristol Uniforms



PPE Testing and Compliance

How important is it for the Personal Protective Equipment (PPE) that you are wearing or that you issue to your Operatives, to be tested and certified to what you believe to be the relevant Standard for the PPE concerned? Because it is so certified, does this mean that it is safe and suitable for purpose? Are you aware of the content of the standard concerned and the performance characteristics to which the product has been tested?

By **JOIFF**

www.joiff.com

Standards are not intended to replicate Work Place hazards but are developed to provide a means of testing to specified performance requirements. On many occasions this results in an attempt to cobble together a number of different performance characteristics for which there are reproducible test methods. Many standards do not provide the comprehensive mix of protective properties that are required in the Work Place and indeed some of them are positively deficient.

Under best Health and Safety Practice – and under European Union Law – the responsibility for

the choice of PPE to protect Workers against foreseeable risks during the task(s) to be carried out falls fairly and squarely on the shoulders of the Employer who is required to carry out a Risk Assessment of the Work Place. If protection is not provided by the PPE for one or more of the risks that have been identified in the Risk Assessment and these risks are not removed from the Work Place of the Employee, then the decision on the type of PPE to purchase is not complete.

Example: Operatives work with materials that are flammable and the main risk is exposure to

sudden flash fires if Work Place Safety procedures break down. The hazard is possible exposure to Heat and/or Flame and common practice is to provide protective clothing that is certified to what is identified as the relevant standard i.e. within the EU(European Union), EN 531:1995 "Protective Clothing for Workers exposed to heat" and outside the EU, ISO (International Standards Organisation) Standard ISO 11612:1998 "Clothing for protection against heat and flame – Test methods and performance requirements for heat protective clothing". The requirements of EN 531 and ISO 11612 are identical.

**The tests that are included in
EN 531 are to achieve a
minimum exposure to various
sources before failure.**

The laboratory tests for "clothing" to be certified to EN 531 are not carried out on clothing, they are carried out on small pieces of material from which the clothing is intended to be made and the material samples tested are destroyed in each test. The tests that are included in EN 531 are to achieve a minimum exposure to various sources before failure. These sources are Limited Flame Spread (A) – a sample of the material is exposed to flame – Convective Heat (B) – a sample of the material is exposed to a convective heat source –

Radiant Heat (C) – a sample of the material is exposed to radiant heat source -molten Aluminium splash (D) – a sample of the material is exposed to splashes of molten aluminium – and molten Iron splash (E) – a sample of the material is exposed to splashes of molten iron. To be certified as complying with EN 531 the "clothing" has to meet the requirements of A and B and at least one other parameter in the standard – then it is deemed fit for purpose !! But is it fit for purpose?

EN 531 does not include any tests for mechanical strength – tensile strength (stretching), tear strength, strength of seams, burst strength for knitted materials etc. There is no requirement for test against contact heat which is a very likely risk when working in hot environments, nor, other than a few pointers for garments to provide protection against molten metal splash, are there any design criteria or tests for the full clothing. There is no provision to test the clothing for resistance to water penetration, to test after use nor is there anything said about maintenance of clothing in use.

Yet when the number of the standard is printed on the label, the general perception is that the clothing has been comprehensively tested to the expected Work Place risks and is safe to use for purpose intended.

Despite the omissions mentioned, there have been few if any reports of injuries or deaths caused due specifically to failure of clothing certified to the standard. Certainly, during the past 11 years since the standard was first published, there

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are many reports of people being injured in the Work Place due to exposure to heat and flame, but the cause has not been identified directly as failure of certified PPE.

In 1999, the Working Groups in CEN and ISO responsible for the standard, identified what they believed to be certain deficiencies and established a Committee to revise it with the aim of removing as many of the perceived deficiencies as possible. The revision was distributed for vote in November 2003 and approved by ISO but not by CEN in March 2004. Currently, whilst most of the National Standards Organisations involved in the voting have agreed to compromise to allow the draft to become a standard, the draft is being held up by CEN bureaucracy.

As a User, have you compared your most recent risk assessments to the relevant standards in EN 531 and are they relevant? Does the lack of a revised standard really make any difference to Safety in the Work Place? Is the User worried about the delayed revision – in fact does the User even know that a final revision has been completed and what is in it?

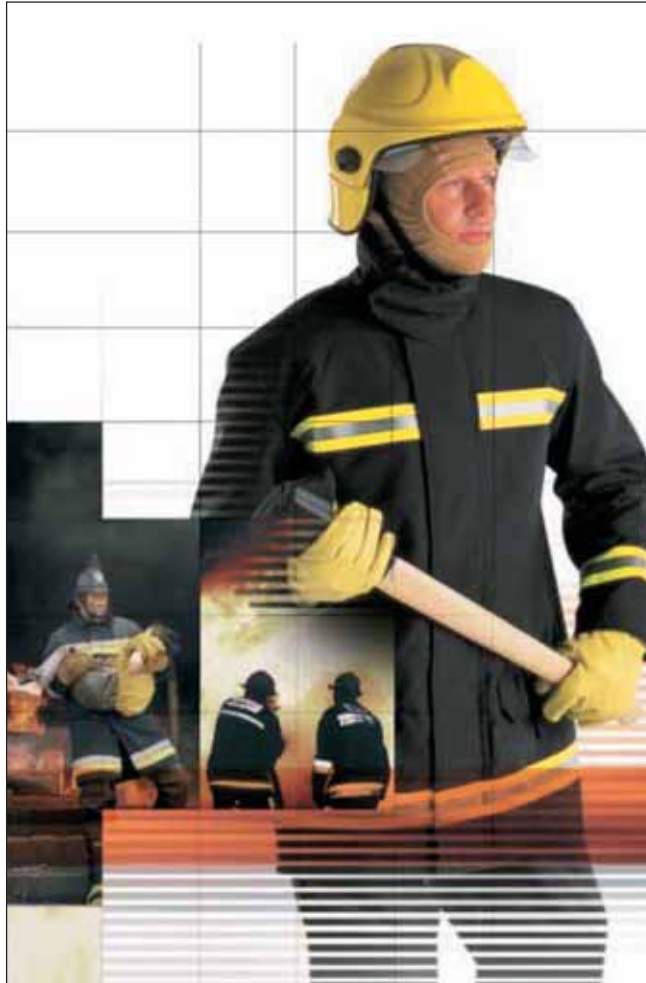
Does the lack of a revised standard really make any difference to Safety in the Work Place?

Who is the real “expert” when User Safety is at stake? Obviously it must be the User – but where is the User on these standards committees? Certainly through diligent Manufacturers and others who are very much aware of the activities on the Market Place, there is a considerable amount of feedback to the Committees but in general, Users are not well represented at the meetings of these Committees.


If the bureaucrats of CEN ever agree to finalise the draft revision and it becomes a new standard in both CEN and ISO, there will be a requirement for considerably more testing in order to have clothing certified. The Manufacturer will have to pay for this extra testing and the extra cost will be passed on to the User. As already stated, there have been few if any reports of injuries or deaths caused due specifically to failure of clothing certified to the standard, so why is a revision necessary? Who should be dictating what happens in the committees writing and revising standards? The Test Houses who make a living from certifying the products? The Manufacturers who must pay the cost of the testing, but in a commercial environment can justifiably pass on this cost to the end User? Or the User, who until now has said very little about what s/he wants from a standard but who is ultimately left with paying the bill for compliance?

Change is necessary, but what has to change, the standards themselves, or the people who decide on what should be in them? Employers, specification writers, end Users, you should be asking yourselves these questions. If you don't you will be faced with extra requirements that you neither want nor need and you will also be required to pay the price for them. **IFF**

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Cutter Opening Distance:	15.2 cm
Weight (ready to use):	15.3 kg
Length:	67.3 cm
Width:	22.9 cm
Depth:	20.3 cm
Cutter Opening Time:	4 seconds
Cutter Closing Time:	4 seconds
Maximum Cutting Force:	319.7 kN
Rated Input Pressure	724 bar



Departments can specify the position of the control valve either parallel or perpendicular in relation to the cutting blades – at the time of ordering. The AMK-21 is anodized for corrosion resistance.

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Holmatro®'s new DPU31 PC Personal Power® pump

With the introduction of the new hydraulic DPU31 PC Personal Power® pump, Holmatro® completes its CORE™ equipped 4000 series tools range. This petrol driven pump is light and silence but yet very powerful and capable of powering two rescue tools simultaneously. Clever details will convince the user that it is designed with rescue in mind. On top of that, this portable pump is fitted with Holmatro®'s revolutionary CORE™ technology.

Operator friendly

The DPU 31 PC excels in operator friendliness. Not only the low weight of the pump will impress, once you carry this powerhouse you will appreciate the excellent balancing. A smart placed centre of gravity eases movements. Of course all hot parts of the pump are shielded. Thanks to smart design, the DPU 31 PC has a very low noise level of 68dB. This reduced noise level is an important factor in creating a better rescuing scene for both victim and rescuer.

The operator can check oil and petrol levels with one look at the gauges on the control panel of the DPU 31 PC. As a true member of the Holmatro® 4000 series, this pump is equipped with the same bright LED lighting.



With these lights the operator can, even in the darkest conditions, locate the pump easily and has an excellent view while coupling and uncoupling.

CORE™ Technology

CORE™ is Holmatro®'s revolutionary hose-in-hose system. Up until the world premiere by Holmatro®, a hydraulic system was always supplied with two connections; one for the pressure line and one for the return line. These lines still exist within the CORE™ system but are integrated in one coupler and one hose. The benefits for the user can be summarized in the following words: "quick, safe and simple"

Quick

The patented CORE™ system enables 'change under flow'. This means that the



hydraulic circuit remains intact even without a tool attached and without having to operate valves. CORE™ couplers can freely rotate 360° which makes it possible to unroll hoses even when connected. Besides this the

Model:	DPU 31 PC
description	petrol driven duo-pump
engine	Honda petrol, 3.5 hp (2.6 kW), 4-stroke
capacity fuel tank	1250 cc
capacity oil tank (effective)	2490 cc
output 1st stage	0-190 bar 2800-3000 (2x) cc/min
output 2nd stage	190-720 bar 550-600 (2x) cc/min
sound level* (at 1 m distance)	68 dB(A)
number of tools that can be operated simultaneously	2
hours of continuous operation (no load)	4
weight (ready for use)	25 kg
dimensions (LxWxH)	600 x 290 x 425 mm
EN 13204	MTO (multiple tool operation)
*sound level with 2 tools at max. pressure at 1m distance accordance to EN 13204: 80 dB	
**when placed horizontally. Under 20° angle, acc. to EN 13204: 2190 cc	

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- Deforming of metal structures
- Peeling man-holes in metal walls
- Pulling away obstacles with chain set

Highlights:

- Opening of steel walls up to 0.24 in./6 mm thickness
- Peels man-holes up to 24 in./610 mm with one single stroke



- Precise operation with your finger tips in any position
- Spreading and peeling without changing of tips
- Operator safety features – all moving mechanical parts are covered

Technical Data:

Spreading force up to	101,000 lbs/450 kN
Spreading distance	24 in./610 mm
Squeezing force up to (at spreader tip)	28,700 lbs/128 kN
Pulling distance up to	17.2 in./437 mm
Pulling force up to	22,200 lbs/99 kN
Dimensions: l x w x h	30.3 x 15 x 8.5 in./770 x 380 x 216 mm
Weight	57.1 lbs/25.9 kg

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- Modern vehicle constructions made of high-strength material
- Urban rescue
- Disaster management

Highlights:

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- Low oil consumption – ideal for the combination with a mobile hydraulic pump (e.g. LUKAS CP 100)
- Precise tool operation with your finger tips in any position
- Fast opening and closing action speeds up the rescue
- Operator safety design – all moving mechanical parts are covered
- Tool fully balanced

Technical Data:

Cutting force up to	120,300 lbs/535 kN
Round steel up to dia.	1.5 in./37 mm
Spreading force up to	50,500 lbs/225 kN
Spreading distance	18.6 in./428 mm
Pulling force up to	14,400 lbs/64 kN
Pulling distance	15 in./381 mm
Dimensions: l x w x h	33.2 x 9.6 x 7.1 in./845 x 245 x 180 mm
Weight	45.2 lbs/20.5 kg

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The battery tool with more performance and less weight than any comparable tool. A combination tool for cutting and spreading with a self-contained, interchangeable.

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- Fast opening and closing speeds up the rescue
- 10 min operation under load with one battery charge
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- The interchangeable Bosch battery system allows for continuous operation
- Very low noise level

Technical Data:

Cutting force up to	56,100 lbs/250 kN
Round stock up to dia.*	1.1 in./27 mm
Spreading force	38,200 lbs/170 kN

Spreading distance	12.5 in./316 mm
Dimensions: l x w x h	31.7 x 10.5 x 7.9 in. 807 x 267 x 200 mm
Weight	34.2 lbs/15.5 kg

For further information, please contact:

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A Unit of IDEX Corporation
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RESQTEC®
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A new generation of rescue tools

There is something new in the hydraulic rescue tool world: RESQTEC Zumro introduces a complete new product line. It started 3 years ago with a concise objective: Create the ultimate in performance rescue tools. This introduction also gives RESQTEC Zumro a new identity and one global name around the world.



Looking at the specifications for the new line of tools it is clear that they should be taken seriously. *Each tool in the new line is the most powerful in its class (light, medium, high) and the lightest.* All RESQTEC tools have the highest power to weight ratio ever achieved.

Impressive, but still the focus was on effective performance and usability of the tool. RESQTEC tools have several technologies incorporated enabling precisely that.



The weight a rescuer experiences during operation is a critical aspect in the performance of a tool, but is influenced by many factors then only the physical weight of a tool. Factors like balance, position to the body and grip influence the real weight a rescuer encounters when operating a tool.

By consulting ergonomic experts and physicians, these factors were researched in depth.

Ergonomic Weight Optimization (EWO) technology influenced most of the design, such as 360 degree carrying handle, the position of the hoses, and asymmetrical control handles. Tools developed with **EWO** technology have made great leaps by reducing weight influence and improving handling.

EWO does three things:

- Gives you the ability to change positions easier and faster.
- Lowers the weight you encounter in operating positions.

- Gives you more control over a tool in the complex positions.

Although RESQTEC tools are low weight, the real weight difference becomes apparent when you go into operation.

Advanced blade design

G and **Fx** series are equipped with the unique Advanced Blade Design (ABD). The ABD enables the tools to have the ability to cut a very wide range of structures, using the power of the tool effectively with extreme strength and durability.

How do ABD blades work? The blades are designed to grab a structure at the beginning and hold it. They then cut over the whole length of the structure. ABD splits the cut over a longer area making it easier for the tool and blade. The tool does not need to generate a peak force to cut the structure all at once, but has a controlled power line during the whole cut. This makes tools with ABD able to cut everything from the high ratings in CE and NFPA, Boron, High-Strength-Low-Alloy (HSLA) steel, to the toughest and biggest of Complex Car Constructions (CCC).

Highlights:

- Equipped with Ultimate Pressure: connect to any working pressure and optimized for performance, control and safety.
- Flat bolt design lowers the insertion height of the tool, enabling you to reach confined spaces more easily.
- 360° turning tail-hoses that do not interfere with the tool's operation.
- RESQTEC tools are delivered with the highest safety factors on critical parts such as 8:1 on tail hoses.
- Quick connectors have automatic locking and flat-face design to prevent sand and dirt from getting into the couplers.
- All RESQTEC tools have dual control. The control can be both thumb and/or twist control.

RESQTEC tools are tested to all of the important standards for different continents, like NFPA 1936 in the U.S and EN-13204 in Europe.

For more information, please contact:

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TNT Rescue Systems, Inc.

CSS-40

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not a good place to use a traditional spreader or bulky hand tools. The CSS-40 Confined Space Spreader offers an impressive 5,000lbs/22.3kN of spread force and weighs in at a mere 17.0lbs/7.7kg. This spreader gives the user a generous 7.5in/190mm spread distance. The compact size (width 3.4in/86.4mm, height 4.1in/104.1mm, length 16.0/406mm) makes this tool useable in numerous tight spaces. This spreader is anodized to protect the tool from wear and corrosion. The arms are serrated for superior gripping and, are covered as is the entire tool by a comprehensive warranty. This tool operates with a hand pump (10,500psi), affording the operator precise control.

This tool is yet another example of how TNT listens to the customer and designs products for the needs of the industry.



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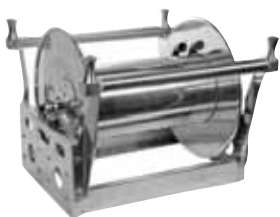


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Personal Alert Safety System (PASS) Devices

What Are They – And Why Do We Need Them

By Craig Walker

We have all seen the fire/rescue service and other investigative agencies issue reports of firefighters becoming lost in burning structures and then sustaining serious injuries or losing their lives. All too often, we learn through these reports that one or more firefighters became separated from their crew or were not accounted for as they began participating in emergency operations on the emergency scene.

Due to a service wide effort to solve this problem, technology was introduced to help reduce these often preventable tragedies. Thus began the evolution of PASS devices. The word PASS is an acronym for Personal Alert Safety System. Its purpose is to sound a loud, highly discernible audio alarm if a distress condition occurs.

Ideally, a properly functioning PASS will alert firefighters that one or more of their comrades is in distress, and enable them to begin rescue efforts. The device will automatically sense an absence of motion if the wearer becomes incapacitated and is immobilized for 30 seconds (plus or minus 5 seconds). Its alarm must function in either the manual or automatic mode to assist rescue crews in locating the firefighter(s) in distress.

NFPA Standard 1822 (1998 edition) requires that PASS be automatically activated, and switched to the *motion sensing* mode without any indepen-

dent action by the wearer. Further, PASS must not be able to be 'turned off' until the operation is complete and they are returned to the *storage* mode. Currently, there are three major types in use in the fire/rescue service. The different types of PASS achieve the *auto-on* function in their own unique manner. The three types of PASS are:

The Stand-Alone PASS – this PASS, as the name implies, operates as an independent piece of safety equipment, and can be used in any operation which may be hazardous area. These units may be used in any situation that endangers firefighters, including those operations where self-contained breathing apparatus (SCBA) is not required. *Auto-on* activation is generally achieved by means of a pull away tether. When firefighters dismount the fire apparatus, the pull away tether releases from the PASS device, automatically switching the unit to the *motion sensing* mode.

SCBA Integrated/Removable PASS – this type of PASS device utilizes the activation of the SCBA air cylinder to turn the unit 'on' and place it in the *motion sensing* mode. They can also be removed from the SCBA to function independently, such as during those operations which do not specify the use of SCBA.

SCBA Integrated Non-Removable PASS – these PASS devices are fully integrated into the SCBA unit. They use activation of the air cylinder to automatically switch the unit into the *motion sensing* mode. The fully integrated PASS, since it is 'built in' to the SCBA cannot be used independently.

PASS devices must be highly reliable and easy to operate. NFPA Standard 1982 requires an alarm sound output of at least 95 dBA, measured at ten feet. Two important parameters of sound that must be considered are sound intensity (loudness) and sound discernibility (the ability to recognize a particular sound in a high background noise environment).

Some of the earlier PASS devices had a loud sound, but were difficult to distinguish above the noise associated with the typical fireground (such as building fire alarm systems, smoke detectors, etc.). Present day PASS devices have overcome the problem of locating the source of the sound signal by modulating a pure tone, or generating a sound that consists of several intermittent tones. Another, and possibly the most desirable audio sound is that of a sweep frequency. This type of sound will generate multiple tones that sweep from 2,000 cycles thru 6,000 cycles. It is not easily masked by background noise.

The sensor that permits a PASS device to operate in the automatic mode is called the motion sensor transducer. This is the heart of the PASS device. If the sensor is not sensitive enough to sense random motion, the device will constantly go into *pre-alarm*, becoming a nuisance to firefighters. The ideal sensor is one that only requires normal motion to keep the PASS inhibited, yet is sensitive enough to immediately sense a lack of motion when a firefighter is immobilized.

Over time, different PASS manufacturers have used a number of methods of sensing motion. Some manufacturers use mechanical devices, such as a small metal ball to sense motion. The random motion of the ball was converted into an electrical signal as long as motion exists. Another popular method to sense motion is accomplished by the closing of a mercury filled switch. Still another method uses a ball inside an infrared light chamber. The motion of the ball interrupts the light signal and is sensed as motion. Perhaps the most progressive method involves an electronic solid-state accelerometer device that can sense a broad range of motion, and is not position sensitive. Accelerometer technology is advancing at a rapid pace. This bodes particularly well for the fire/rescue service because at the end of the day, PASS devices will become even more versatile than they are today.

Most PASS manufacturers use a custom microchip or a microprocessor to process the functions of the devices. Some chip functions are sensing low battery, discerning the wearer's motion or lack thereof, and sound generation in the various modes. A quartz crystal is often used to ensure accurate timing and activation of the *pre-alarm* and *alarm* sound signatures.

Electronic monitoring of emergency personnel is on the near horizon. This new technology promises to become commonplace to carry the fire/rescue service into future. The main components of this type of system are a radio-transmitting PASS Alarm worn by firefighters, a command receiver to receive and collect signals within the vicinity of the emergency scene, a computer to interpret and display the signals received. This will provide the on-scene fire officer with instantaneous information in a useful format, which can be used to enhance the incident command management system employed.

The command receiver, arriving at the emergency incident with the command officer, is placed in service simply by flipping the power switch and turning on the computer. The unit is completely self-contained and can operate on the system batteries, a 12-volt vehicle battery (cigarette lighter), or any 110-volt power source. The touch screen computer is programmed to immediately begin monitoring personnel within seconds. No extra commands or keystrokes are necessary, and total accountability begins usually before the command officer can exit his or her vehicle.

All personnel who have arrived prior to the command officer are displayed on the screen. Options include displaying all personnel regardless of whether or not their PASS have been automatically activated. The PASS devices worn by responding personnel transmit a unique signal that identifies the wearer by name, ID number, company assignment, and any other information desired. The apparatus, which is equipped with a small transmitter similar to that worn by personnel arriving on the scene, is also noted and displayed. As more apparatus and personnel arrive, they are automatically added as they come within the specified range of the receiver.

The PASS devices worn by firefighters continuously send out a unique signal that identifies the wearer, verifies whether the device is activated and measures the lack of motion. The signal is received by the command receiver immediately as the firefighter arrives on the scene. Should the firefighter become motionless for 25 seconds, or manually activate the alarm, a distress signal is transmitted as well as the normal, audible local PASS *alarm* signal.

The exact time that a firefighter's PASS device is activated, and the time of any subsequent alarms is automatically stored in the memory of the computer for review, either at the emergency scene or for post incident review or training purposes at a later date. This information is useful to ensure that all personnel are utilizing their PASS alarms as specified in your department's operating procedures.

Two-way signaling ability is another advancement which provides incident commanders the ability to send *EVACUATE* signals to selected individuals, groups, or all firefighters operating at the incident. This feature is invaluable in the event that conditions deteriorate or that the building is in imminent danger of collapse or flashover.

PASS devices and the more sophisticated radio signaling PASS systems are tools that will make firefighting safer and will go a long way in preventing needless firefighter deaths. Simply knowing the identity of firefighters in distress at the Command Post location will ensure prompt rescue efforts and enhance the chances for firefighter survival. **IFF**

Craig A. Walker is a retired Division Chief who served for 25 years in the Prince George's County, Maryland, Fire Department. During his career, he was heavily involved in safety and health issues, including personnel accountability. He is currently president of Grace Industries – Sales Division.

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Maintaining your foam systems

By Joan Leedy

President, Dyne Technologies, LLC

Foam fire protection systems are commonly used in industry to protect against flammable liquid hazards. These systems can be used with a variety of foam products. For example, standard foam concentrates – used to extinguish ordinary hydrocarbons, such as gasoline, heptane, crude oil, and the like – and alcohol-resistant foams, used to extinguish polar solvents, including alcohols, ketones and ethers, as well as ordinary hydrocarbons.

Most systems store the foam as a concentrate until the system operates. At that time, the foam is proportioned at the proper concentration (3 or 6 percent, for example) into a water stream where it is diluted, mixed and transported to a foam delivery device. The most common foam delivery devices are sprinkler heads, monitor/nozzles or foam chambers.

Maintenance of any system is key to its performance. Foam fire protection systems are no exception. The National Fire Protection Association Standard 11 Standard of Low-, Medium- and High-Expansion Foam, 2005 Edition, reads as follows:

Chapter 11 Maintenance Section 11-1 Periodic Inspection

At least annually, all foam systems shall be thoroughly inspected and checked for proper operation. The inspection shall include performance evaluation of the foam concentrate or premix solution quality or both. Test results that

deviate more than 10 percent from those recorded in acceptance testing shall be discussed immediately with the manufacturer. The goal of this inspection and testing shall be to ensure that the system is in full operating condition and that it remains in that condition until the next inspection. The inspection report, with recommendations, shall be filed with the owner. Between the regular service contract inspections or tests, the system shall be inspected by competent personnel following an approved schedule.

Furthermore, **Section 11.6 Foam Concentrate Inspection** reads as follows:

At least annually, an inspection shall be made of the foam concentrates and their tanks or storage containers for evidence of excessive sludging or deterioration. Samples of concentrates shall be sent to the manufacturer or qualified laboratory for quality condition testing.

Following are several common problems uncovered during annual inspections:



- By far the most common problem is **dilution of the foam concentrate with water**, because the foam tank has not been properly isolated or the system is not properly designed. Properly designed foam systems will include foam concentrate isolation valves and backflow prevention valves. However, even in a properly designed system, these valves can be overridden accidentally by a contractor or employee who is not familiar with the system. If foam is diluted significantly, it will not effectively extinguish a fire.
- **Filling the system with the wrong type of foam.** Incidents have been documented where a non-alcohol resistant foam concentrate has been used to fill a foam system that protects a polar solvent. Non-alcohol resistant foams are not effective at extinguishing a polar solvent fire. In addition, systems can be accidentally filled with the wrong concentration of foam, such as filling a 3% system with a 6% foam or vice versa.
- **Foams that should not be mixed are mixed in a storage tank.** NFPA 11 also recommends that different types and brands of foams not be mixed in storage. Cases exist where two alcohol resistant foams became mixed in storage. This caused the polymer to drop out of solution and plug the piping, restricting any foam concentrate from proportioning into the system.
- **The foam concentrate does not match the hazard.** Perhaps the hazard originally contained only ordinary hydrocarbons and as such was protected by a standard foam concentrate; later, polar solvents were brought into the area but the foam system was not upgraded to an alcohol-resistant foam.

Several things can be done to prevent these problems from occurring. First of all, properly train the personnel who service and inspect your foam system. Second, consider buying a service contract with a qualified system servicing company. Third, properly label your foam tanks, indicating the type of foam that is in the tank. And finally, make sure the foam concentrate is tested annually, so if the foam concentrate is no longer effective, it can be replaced.

Annual foam testing will determine the type of foam concentrate—standard foam or alcohol resistant foam—and its effectiveness at extinguishing a fire. In addition, foam testing will verify that the foam is a 1%, 3%, or 6% foam concentrate and whether it is a freeze protected foam or not.

In order to correctly sample the foam concentrate it is important to obtain a representative sample. When taking a foam sample, first drain a half to one gallon of foam concentrate from the piping. Then drain a sample into a clean, sixteen-ounce sampling container. For large tanks, consider taking a sample from both the top and the bottom of the tank. Correctly label the sample jars and send the foam to an approved testing laboratory.

A number of foam manufacturers and independent laboratories offer these testing services for fees ranging from approximately \$100 to \$200 per sample. They will typically test the following properties:

Refractive index or conductivity – This gives an indication as to whether the foam is full strength or if it has been diluted with water. This value also gives an indication as to whether the foam is a 1%, 3% or 6% concentrate and whether it is freeze protected or not.

Freeze Point – This value is measured to verify that the concentrate is freeze protected and to determine its exact freezing point value.

Viscosity – This value is compared to the viscosity specification of the product when it was new. Proper viscosity is important to ensure the product will accurately mix through the proportioning system.

pH – This value is compared to the pH specification of the foam concentrate. A pH value out of specification can indicate the foam is contaminated and could cause an ingredient to drop out of solution making the foam concentrate ineffective. An extremely high or low pH can also cause corrosion of the system tanks and piping.

Specific gravity or density – The density of the foam concentrate can also indicate if the foam is full strength or has possibly been diluted.

The following tests are conducted on a premix solution by mixing the concentrate with water at the appropriate concentration (such as 3 parts concentrate to 97 parts water if the foam is a 3% AFFF):

Expansion – Measured using a variety of test methods that have been developed by the various foam manufacturers. The expansion ratio predicts the rate at which the foam will expand as it is applied through a nozzle, sprinkler or other foam-making device.

Drain Time – Measured to determine the time for the foam to drain back to a foam solution. Typically the 25 percent drain time is documented, indicating the time it takes for 25 percent of the foam sample to drain into a foam solution.

Film formation – For AFFF foam products, a variety of film formation tests exist that ensure the product will still form a film on non polar solvents.

It is important to obtain and file the results of the annual foam tests. Potential problems can be identified and diverted by comparing the results of the foam testing to the original foam properties. As an example, if the refractive index of the foam concentrate is within specification but is significantly lower than the last time the value was measured, the foam may have been diluted – but not to the point where it will require replacement. By determining how the foam was diluted and preventing further dilution, the concentrate in the tank can be saved – potentially saving thousands of dollars in replacement costs.

IFF

Dyne Technologies is an independent, ISO certified, laboratory that conducts annual foam testing for industrial concerns, fire departments and military installations across the United States. As part of its services, the firm provides customers with free foam sampling kits and pre-paid shipping containers. Dyne stores customers' test results on their database for future reference and sends annual reminders for re-testing.

Joan Leedy is president and technical director of Dyne Technologies, St. Paul, Minnesota. She received her Bachelor of Science degree in Chemical Engineering from the University of Minnesota and a Masters in Business Administration from the College of St. Thomas. She is a member of the National Fire Protection Association currently serving on the Technical Committee on Foam.

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Master Stream Appliances

Firefighting oftentimes is like a sports team. You have an offensive unit and a defensive unit. In structural firefighting many times you go on the offensive mode. Most industrial fires, depending on the size and type of fire involved require the team to go on the defensive mode. When you go on the defensive side you would normally bring in the master streams, or the big guns which give you a lot more firepower.

By Dave Cochran

Master Streams are denoted as devices that are not held by hand. Generally they are devices that will flow water over 350 gallons of per minute (1325 L/min). These include ground monitors or deluge sets, ladder pipes, and ultra large flow devices which flow from 2,000 gallons per minute to 14,000 gallons per minute. The ultra flow devices are primarily used for industrial facilities, but have a place in Municipal or Volunteer departments that have large industrial or mercantile facilities in their area of responsibility. I can remember as a young firefighter operating a 2½" straight tip nozzle flowing 250 gpm with three (3) of us holding it. I will tell you this was a task even with us sitting on the ground, holding the straps. It became much easier making a loop and placing the straight run under the loop. Sitting on the loop/straight run junction, it was much easier and safer. The biggest job then was to hold the nozzle in a useable position. I like to think we have gotten much smarter since those times. Ground monitors, apparatus mounted, and trailer

mounted monitors have eliminated holding large flow lines. Constant flow nozzles deliver a specified flow at a given pressure, while automatic or constant pressure nozzles have a flow that is regulated by pressure, which requires the nozzle person to be in contact with the pump operator. Newer automatic nozzles have a dual- pressure option for normal and low pressure situations that are controlled by the nozzle man. One company has come out with low pressure nozzles that deliver higher gpm's at lower pressures. These are not only helpful to the firefighter, but also make them more suitable for aerial devices, which are limited to gpm flow because of the back pressure created during operation.

Master stream devices can be considered dangerous if not properly deployed, and firefighters involved in fire combat should be made aware that these devices are about to be put into service. Those devices that are permanently mounted on fire apparatus are not a danger as far as the possibility for them to move and create a hazard to

Picture courtesy of
Williams Fire & Hazard
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nearby fire fighters. If there is any danger it would be possibly hitting firefighters with the stream created. The largest apparatus mounted device I am aware of is 4,000 gallons per minute. Some devices capable of delivering more than 1,000 gallons per minute are trailer mounted, and in fact, to my knowledge all devices over 4,000 gallons per minute are trailer mounted. While these devices are relatively safe, they MUST be operated according to the manufacturers specifications. For example a 10,000 gallon per minute device operating at 100 psi, will have a reaction force of 5,050 pounds. Anything with this force must be given a great deal of respect. Only those involved with the operation of these devices should be in the vicinity. Some of us have seen a trailer mounted monitor flowing 2,000 gpm move a foot from its original position when charged, with the nozzle rotated towards the side 90 degrees from its forward position. While many of these devices are designed to flow only water, several are designed to flow both water and foam. These have more versatility, and thus are primarily used in the industrial sector.

The original large combination flow devices began as 350 gallons per minute, were designed for both water and foam and were self-educing. They were fed foam through a proportioning device called a jet-pump or double sucker. Water was fed from the pump through a 1½ inch or three quarter inch hose line to the foam concentrate logistical area, where the pick-up tube was dropped into foam drums. The concentrate was then picked up and was transported to the nozzle as foam solution through a 2½ inch or 3 inch line. There was not a lot of pressure on the discharge side, and as the flow got to within approximately 10-15 feet of the nozzle the flow created through the nozzle then educted the solution into the nozzle. From the foam eductor (jet pump) the

solution was very rich, (662/3 mixture), and when it reached the nozzle it was then reduced to approximately a 3% mixture. This technology has now been engineered to a 14,000 gallon per minute delivery device. One of the first fire situations at which these devices were used occurred in the early 1980s on a ship fire in the Gulf of Mexico. They worked extremely well, and became

One of the first fire situations at which these devices were used occurred in the early 1980s on a ship fire in the Gulf of Mexico.

the industrial firefighting norm when foam was required, not to mention for water usage as well. When the self-educing, non-aerating nozzles hit the industry, some manufacturers refused to believe finished foam could be made and used on storage tank or other fire situations that required firefighting foam. They felt the big bubbles were the only way to go. Were they ever wrong? I assure you they were. It took several years before they admitted they were wrong in their thinking. I later went to work for a major foam manufacturer-after working for the major Industrial & Marine Firefighting team in the world, and it took another year or two before a meeting was called to develop a system and equipment to get them into the "big time". Then it took another year to get everything ready to go to market. By this time they became the new kid on the block, and are still playing catch up-even though they have a great product. I will never forget the president of that organization- a great guy and friend, who walked out of the meeting with a "get it done, no matter

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what it takes" statement. He simply could not listen to what he knew was coming yet he knew it was the only way to go.

Every one who markets these big delivery devices use range as a selling point, and it is true range is important. However, in some cases range can be a hindrance. For example if a fire occurs in a tank

farm, and the tank involved is in the middle of several other tanks, it might not be possible to position the delivery device(s) that will allow for the stream(s) to hit the target area in a pattern sufficient to make a successful extinguishment-and not use a lot more foam concentrate than that required. If the delivery device is capable of being opened to

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narrow patterns, the target might be reachable, but, when doing so, be prepared to use a lot more concentrate than that required. Waste, or fall out will be tremendous. The same goes for devices that have less reach, and the target is too far away for the stream(s) to reach the vessel involved. The answer to all of these questions obviously is to preplan the facility ahead of time-which you should have done before ever considering the purchase of any large volume delivery device(s). It may, and probably will, take a combination of different devices to protect your facility. It may not require you to purchase the number of devices necessary to protect the facility. If you are part of a mutual aid group, spread the cost around and have each facility purchase the various type and size of the equipment necessary. This has been done with some success on the gulf coast of the United States.

When tank fires occur, often times a running spill fire will be in evidence. The book says this fire should be extinguished first. Remember this; neither foam nor water can be used to extinguish this type of fire situation. The spill can be extinguished, but the leaking flange or valve cannot. It will require a dry chemical to do so. As a result



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another nozzle has been developed that allows for dry chemical (purple K) to be dispensed through the center of the nozzle to make this type of extinguishment. The foam/water stream encompasses the PKP stream and carries it to the source. The size of the nozzle and PKP dictate the range of effectiveness of these devices. These can be used in any number of situations other than those that involve storage tanks.

Water is very dangerous if you consider the amount of force involved. For example, a 10,000 gpm delivery device if all of the stream were to land in one area, would have a force of 87,500 pounds. If used carelessly tremendous damage can

Water is very dangerous if you consider the amount of force involved. For example, a 10,000 gpm delivery device if all of the stream were to land in one area, would have a force of 87,500 pounds.

be done to equipment such as buildings, piping, etc. One might ask, what do I care as long as the fire goes out. I would agree. BUT, it is very possible and conceivable more damage could be made to the situation if some care is not taken. The footprint of the stream, fortunately spreads out, and depending on the distance it is being thrown, obviously the amount of force is reduced. IF for example a device is being used to combat a fire in a refinery, chemical plant or other similar situation, any equipment, piping, instrumentation, insulation, etc. that might receive the full force of the stream, could be ruptured, or broken and create additional problems. In situations such as this, distance can be a big help and perhaps not create additional problems for firefighters. Operating unit fire situations in refinery and chemical plants for the most part are not of the size and type to require big flows. But, they do occur and you need to be prepared for them. In many cases, high rise fire situations occur in these facilities, which require for fire streams to reach upwards towards the top of struc-

tures. The device called the Ambassador can obtain a vertical reach of 235' @ 6,000 gpm and set at 80 degrees elevation. While some of these structures are much higher, a team certainly has a better opportunity to combat fires in high rise units. A good preplan MIGHT allow for mounting large flow devices onto nearby vessels so that coverage to these higher structures can be better protected.

Because of the success of these, the inventor, Mr. Leslie P. Williams founder of Williams Fire & Hazard Control continued to develop larger devices for large flow requirements. Since then these devices have been used on hundreds of industrial

The device called the Ambassador can obtain a vertical reach of 235' @ 6,000 gpm and set at 80 degrees elevation. While some of these structures are much higher, a team certainly has a better opportunity to combat fires in high rise units.

facility fires including ship and storage tank fires. The largest known storage tank fire to be extinguished was a 270 foot unleaded gasoline tank.

Since then at least one other manufacturer has come up with their version of self educting nozzle. This one uses a ring jet injection method of induction. The devices range from 1,500 to 3,000 gpm.

The latest type of foam/water delivery device to hit the industry is the Ironman which have gallon per minute ranges from 4,000 to 10,000 gallons per minute. The Williams devices are fog nozzle type, adjustable by rotating the nozzle just as you would a standard fog nozzle. The Iron man is adjusted by using a hydraulically operated stream changer to move from straight stream to a semi-fog pattern. Hose lines are hooked into a large manifold which feeds a 25 foot section of 12 inch hose that is connected to the monitor. Foam is injected into the system with around the pump proportioning.

When using these large and ultra large flow devices, it takes time to get everything set up and

go into service. Generally, for every thousand gallon per minute it takes one 5 inch hose line to feed the device. Depending on the length of hose lay, and number of lines to be deployed will dictate the time it takes to go into service. The previously mentioned 270 foot tank fire required approximately 5 hours before the first foam was put onto the fire. In addition, and simultaneously, pumps are being set, foam logistics are being established, so that once everything is ready, a uninterrupted firefighting effort will take place. If you have done your homework you should have a success story to tell.

It is highly recommended you investigate those who manufacture the large and ultra large flow delivery devices, and make a strong pre-plan of your facility before investing in these very valuable pieces of equipment for your arsenal. **IFF**



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Marine Gas Detection and Firefighting

The marine environment covers a wealth of vessels, many of which transport chemicals, crude oil, LPG and other dangerous substances that carry a risk of explosion. For this reason every vessel is required to carry gas detection equipment to monitor oxygen, toxic and explosive gas levels as well as firefighting equipment.

By Ian White

UK Product Manager
Gas Detection Portables
Draeger Safety

Gas Detection

One of the best ways to fight fires is to make sure that they do not start in the first place and, particularly on board ships, that means eliminating all potential sources of ignition. Gas hazards can occur at any time from a number of different sources and, with fleets of ships each carrying different cargo, ship management companies have to deal with a host of monitoring requirements. The most obvious example is when loading, unloading and transporting cargo in containers and tanks. Crews on Liquefied Natural Gas (LNG) Tankers, for example, will need to monitor for methane, whilst propane will often be a potential hazard on Liquefied Petroleum Gas (LPG)

Tankers. Oil tankers carrying crude oil are less straightforward in that crude oil can give off a wide variety of gases such as methane, propane, butane, pentane and hexane.

As well as the provision of appropriate equipment, marine management organisations also have the logistical problem of “landing” equipment to ensure calibration within the manufacturer’s recommendations. In addition, there are repairs to arrange and replacement products to order, as well as the need to transport calibration or bump gases to the vessel, wherever it may be. This involves transportation of dangerous goods, by air, and can be very expensive, cumbersome and difficult to manage.



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Until now, the severe penalties for sailing without proper gas detection provision has resulted in an increased number of gas monitors being purchased so that ships and management companies have a sufficient supply to carry out the work and be ready for any inspection.

Whilst most of the legislative documentation highlights the need to adhere to manufacturer's written guidelines for the service and calibration of all gas detection equipment (usually every six months), there is a move within the industry to comply with the requirements of the "Oil Majors". Although these "Majors" usually insist that the six monthly guidelines are strictly adhered to, they are allowing some of the test and calibration to be performed by the ship's crew, provided they are trained and supported properly. In addition, every so often the gas monitors are required to be "landed" to an authorised and competent technical service station for a shore based service and calibration which should be returned with a valid calibration certificate.

As each ship might be carrying a number of monitors from different manufacturers, the return of each instrument to its source (or approved agent) for calibration and/or repair, and then its transportation back to the vessel, adds to the challenge – not to mention the administration and costs involved!

Marine specialist, International Mining and Marine Limited (IM&M), has come up with a solution that minimises the problems associated with the transportation of dangerous goods and helps to eliminate the need for ship management companies to manage the replacement or repair process. By utilising innovative Draeger sensor technology in its Meter Tracker System, this simple yet reliable method not only meets legislative requirements but it also saves time and money by reducing both administration and communications and minimising logistics planning.

When a monitor is due for service, IM&M contacts the management company to ascertain the next port of call. Identical, pre-calibrated and fully serviced gas detection instruments, together with the appropriate calibration gases, are then sent to the port to await the arrival of the vessel. The instruments are then exchanged and, once returned to IM&M are then repaired or recalibrated as required and placed into stores awaiting the next exchange for the next vessel on the list.

Featuring state-of-the-art, precalibrated sensor technology for a fast, accurate response to changing gas concentrations, the Meter Tracker incorporates Draeger X-am gas detection instruments. Meeting ATEX, UL and CSA approvals, these easy to use, rugged instruments ensure paramount safety by emitting both audible and visual as well as vibration alarms. Of significant benefit, however, is the fact that they can easily be calibrated by trained members of the ship's crew

A host of other potential hazards exist on board. Diesel engines, including those used in auxiliary generators, can also emit carbon monoxide, carbon dioxide, sulphur dioxide, nitrogen dioxide and formaldehyde. Agricultural commodities such as grain or tobacco are fumigated with phosphine to control pests during transportation, and combustible materials such as fuels are blanketed with nitrogen or diesel exhaust fumes to inert the atmosphere and prevent fire or explosion. In the case of the current trend towards double skinned tankers, the voids are often purged with a neutral atmosphere to prevent fire.

The fumigation of containers can bring its own problems in that different fumigants

are used for different materials. In many cases the shipping document does not state the type of fumigant used or, worse still, gives no indication that the container has been fumigated at all.

Luckily, the most common fumigants can easily be detected with the Draeger Fumigation Test Kit. Providing both an accurate, on-the-spot result for up to five unknown fumigants simultaneously, it can also be used to assess a single gas. The kit includes a 40cm long probe for gaining access to containers via the rubber door seal as well as Sulphuryl Fluoride, Methyl Bromide, Ethylene Oxide, Carbon Tetrachloride, Hydrogen Cyanide, Phosphine, Ammonia and Formaldehyde Tubes. This means that, if the type of fumigant used is unknown, a simultaneous test can be carried out to determine which gas may be present. If there is still no indication, the Sulphuryl Fluoride and/or Carbon Tetrachloride and/or Ethylene Oxide Tubes can then be used. In those instances where the fumigant gas is known monitoring can be carried out using the relevant Draeger-Tube.

Of course, containers can also be included in the terms "enclosed space" or "confined space".

The International Safety Guide for Oil Tanker and Terminals (ISGOTT) defines an enclosed space as being a space "with restricted access that is not subject to continuous ventilation" and goes on to state that "any decision to enter an enclosed space should only be taken after the atmosphere within the space has been comprehensively tested from outside the space with test equipment that has been recently calibrated and checked for correct operation."

Whilst ISGOTT takes into account the general confined space entry requirements that apply to onshore industry, it provides the main emphasis for Tankers and, within the definition of confined space, includes cargo tanks, ballast tanks, fuel tanks, water tanks, lubricating oil tanks, slop and waste tanks, sewage tanks, cofferdams, duct keels and voids. However, these confined spaces are not limited to Oil and Gas Tankers and can be found on most types of vessels including Container Ships carrying all manner of cargo, dry cargo Bulkers, refrigerated Reefers and, of course, Ro-Ro ferries and carriers.

Anyone entering enclosed or confined spaces must ensure that they use appropriate equipment to check for the presence (or lack of) oxygen as well as toxic and explosive gases before entry and during their exposure within the confined space. One of the simplest methods is to use a multi-gas warning device such as the Draeger X-am 3000. This 3 or 4 gas monitoring instrument provides reliable monitoring of H_2S , CO , O_2 and combustible gases and vapours in ambient air. Featuring Draeger sensors for a fast, accurate response to changing gas concentrations, it benefits from simple three-button operation and boasts straightforward menu selection as well as a large display for straightforward measurement identification. The precalibrated electrochemical sensors and the catalytic sensor are automatically recognised and provide precise and reliable measuring results.

All those working in confined spaces should also ensure that they have a means of



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ISGOTT also states that "When it is required to gas free a tank after washing, it should first be purged with inert gas to reduce the hydrocarbon content to 2% or less by volume so that, during subsequent gas freeing, no portion of the tank atmosphere is brought within the flammable range."

The subject of inert gassing is also covered by IMO guidelines known as "Safety of Life at Sea" (SOLAS) 1974 which state that "Inert gas systems should be available and capable of providing inert gas with an Oxygen concentration of less than 5% by volume".

Both of these statements relate to the "explosive triangle" and are intended to ensure that concentrations of gas, within which a spark may ignite and lead to an explosion, never exist – either there is no flammable gas (inert gas) or, if flammable gas is being introduced, there isn't sufficient oxygen to cause an explosion.

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applications, ATEX-approved gas detection systems such as the Draeger X-am 7000 can provide continuous detection of up to five gases simultaneously. Utilising a combination of more than 25 sensors, this particular model enables the detection of over 100 toxic and combustible gases and vapours as well as oxygen. Draeger's sensor exchange functionality means that it can be reconfigured simply by changing a sensor and, as an added bonus, the measuring range and target gas of these sensors can also be changed at the push of a button and without needing recalibration.

Prevention is obviously better than cure and although the aim is to stop a hazardous environment from becoming a hazard to health, fires can and do happen.

Fighting Fires

The subject of firefighting is vast and is far too complex to be discussed fully within this article. Full details can be found in the SOLAS Regulations, which provide information on fire safety provisions for all ships, and gives specific measures for passenger ships, cargo ships and tankers. However, should the worst happen and a fire was to break out, there is one thing that every firefighter will need: compressed air breathing apparatus (CABA).

Used daily for training purposes and always kept at the ready in the case of an emergency, CABA needs to be easy to use, reliable in operation and effective in performance. The good news is that recent design and functionality enhancements have brought about greater flexibility in use, more comfort for the wearer and improved cost effectiveness – not just for today but also well into the future.

A wide variety of breathing apparatus (BA) is available for different applications. Generally speaking, for maritime applications where the BA is likely to be used infrequently, a traditional, more basic system can be used.

Whichever type is specified, it should be stored at readily accessible locations throughout the vessel, be quick and simple to don and easy to use. Of equal importance, it should be capable of future upgrade as technology progresses.

With an ergonomic design, improved flow characteristics, streamlined whistle and easier connection for accessories, the Draeger PAS, Streamline CABA, for instance, combines light weight with reliable performance. Ideal for use within the marine industry when entering confined spaces, containers and firefighting, it is first breath activated and can be used with cylinders of all sizes from 4 to 12 litres in capacity. As with all Draeger BA, it uses the same pneumatics and technologically advanced components so that not only can the entire range be upgraded in the future but it also operates using the same maintenance schedules and pneumatics parts inventory.

In accordance with International Maritime Organisation (IMO) Regulations, Emergency Escape Breathing Devices (EEBD) such as the Draeger Saver CF should also be carried by firefighters to give to personnel in need of assistance. Firefighters can also be given additional protection with the use of the latest electronic monitoring units and sophisticated telemetry systems as well as helmets with built-in communications, and cooling vests for use in the hottest environments. To complete the portfolio, other personal protective equipment can include chemical protection suits and extended duration airline systems.

IFF

Further information is available from:
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Industrial Firefighting Foams:

Selecting the Right Foam System

By Peter Kristenson

Product Manager for
foam products at Tyco
Fire and Security's Fire
Suppression Group

While foam has been used for industrial fire fighting for decades, there is more to selecting the right foam than might first meet the eye. Here, Peter Kristenson, Product Manager for foam products at Tyco Fire and Security's Fire Suppression Group, which designs and manufactures sophisticated foam-based firefighting systems, explores some of the issues affecting system selection and the latest foam agents to come onto the market.

Basically, firefighting foam is a mixture of water, foam concentrate and air; a stable mass of small, air-filled bubbles that has a lower density than oil, petrol, or water. The foam concentrate is injected into the water by means of a foam concentrate proportioning unit, and the resulting blend is fed to a foam generator. In most cases this is located at the end of the pipe or hose that is used to deliver the mixture. The foam generator sucks-in air, which combines with the liquid mixture to create the firefighting foam.

Foam separates the fuel from the oxygen; it effectively smothers the fire, while its high water content provides effective cooling. Well-formulated foam, correctly applied, exhibits a number of characteristics. These include stability, cohesion, rapid fire-knockdown, heat resistance and vapour suppression; all of which will ensure that a fire is extinguished efficiently and securely to prevent reignition.

In essence there are three categories of foam, which are determined by the volume of foam that is created by a given amount of water. These are low expansion foam or Low-Ex; medium expansion foam or Med-Ex; and high expansion foam or Hi-Ex. Low-Ex foam has an expansion factor of up to 20; Med-Ex a factor between 20 and 200; and Hi-Ex a factor higher than 200.

Low-Ex foam is often generated using equipment such as a foam monitor, a foam branch pipe or a foam sprinkler, while Med-Ex foam uses a Med-Ex foam branch pipe or a Med-Ex sprinkler. A Hi-Ex generator is used to create Hi-Ex foam, and this usually incorporates a fan that ensures that the required amount of air is available for the foam production. This fan can be driven by a petrol or diesel engine, or by a water turbine, but electricity is the most common power source for conventional fixed installations in enclosed areas.

Firefighting foam options

There have, in recent years, been many advances in the field of foam concentrates, and some suppliers have been somewhat over enthusiastic when promoting their own type of generic product, the formulation of which has been dependent upon the company's manufacturing capability.

However, it is important to be aware of the wide range of foam formulations that are available today. These range from the low cost but highly stable protein foams, through to the latest leading-edge synthetic products, such as Tyco's Thunderstorm 1 x 3, which was developed in consultation with Williams Fire and Hazard Control Inc, probably the world's most highly respected specialist in the fire protection of flammable liquids. Briefly though, the types of foam currently on the market can be categorised as protein foams; fluoroprotein foams; aqueous film forming foams (AFFF); film forming fluoroprotein foams;

and alcohol resistant concentrates.

Of course, it is not merely a matter of selecting the type of foam, critically important though that is; it is equally essential to decide on a supplier of foam concentrate and provider of delivery systems. And this must be a decision that is not based on cost alone! Continuity of supply, technical support, engineering know-how, manufacturing resources and industry expertise all have to be assessed.

High expansion foam systems

Due to the often-hazardous nature of the content many warehouses and distribution centres, they represent a significant potential fire risk and foam systems are increasingly being seen as the most suitable firefighting solution. This is particularly so where flammable liquids are stored or used during the manufacturing process.

In these often-voluminous structures, high expansion foam is the ideal choice owing to its low water content, which will minimise the damage to paper or board packaging. This is because, for each litre of water used, between 600 litres and 1000 litres of foam bubbles are generated.

A Hi-Ex foam will rapidly – within minutes of its release – completely fill the space in which the fire has occurred, and so extinguish the blaze. However, only synthetic foam concentrates can be applied, and the performance of a Hi-Ex foam system is highly dependent on the quality of the foam concentrate that is used.

Hi-Ex foam extinguishes a fire in several ways. The water within the foam is turned into steam and contributes towards to a rapid cooling of the fire; the steam also acts as an inerting agent and reduces the oxygen content of the air; the excellent isolating function of Hi-Ex foam prevents heat from spreading and setting other objects alight; and the foam prevents flammable gases from spreading and igniting.

To produce the foam, a conventional Hi-Ex system takes fresh air from outside the protected area and, as the foam is discharged into the protected area, a corresponding amount of air must be ventilated out of this space. This is usually achieved by using a smoke ventilation system. A characteristic of a Hi-Ex system is that the total amount of water required to extinguish a fire is, in relative terms, small, so the total amount of extinguishing media to be cleaned up once the fire has been extinguished is also minimised.

Hotfoam warehouse protection

More than a decade ago, Tyco pioneered the technology of producing Hi-Ex foam using smoke-contaminated air. Early tests proved that the introduction of smoke gases in the air supply to conventional Hi-Ex generators reduced, or completely eliminated, the need for foam production by the generator. The same is true if the air supply, in addition to containing smoke, gas and particles, is also very hot.

This development programme led to the introduction of Hi-Ex foam generators that have no moving parts, and to a new, specially-formulated foam concentrate, from which a good quality foam can be produced under these very challenging conditions.

The outcome was the introduction by Tyco of

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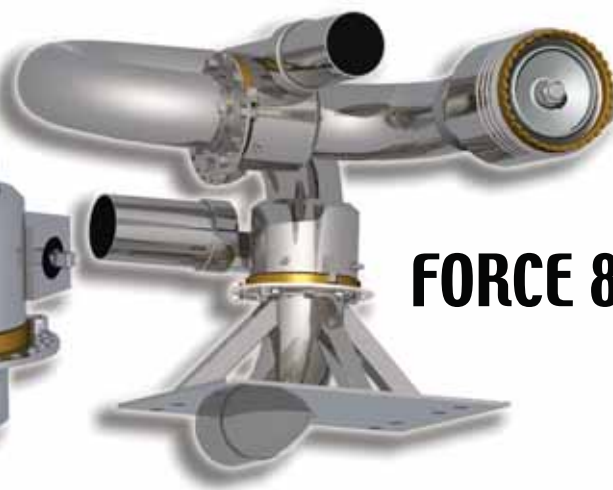


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Skum HotFoam, which operates on very different principles to conventional Hi-Ex systems. With HotFoam, the foam generators – which do not require power in any form – are located inside the protected space, using the air and smoke from the fire itself to generate foam bubbles. This does away with the need for an external fresh air supply for the foam production, and provides the flexibility and effectiveness often required for warehouse protection. In addition, the rapid knock-down of the flames and heat helps to minimise damage to the building structure and its contents. HotFoam can be effectively used on both hydrocarbon and polar solvent liquids, as well as solid combustibles, such as rubber, plastic, wood, paper and chemicals.

Typical applications for HotFoam include indoor hazardous areas, such as chemical and petrochemical processing plants, warehouses, and flammable material production facilities. Other applications include tunnels – including cable tunnels, vehicle and rail tunnels – transformer stations and any spaces where an efficient fire fighting system is required that utilises a minimum amount of water.

The foam station for a HotFoam system consists of a water source; water pump; foam proportioner; Skum's Meteor P foam concentrate; a foam concentrate tank; the HotFoam control system; valves; fittings and piping; and the HotFoam generators. As with conventional Hi-Ex foams, HotFoam provides quick and effective extinguishing of a fire and has low water consumption.

A HotFoam installation requires minimal maintenance; air ducts, wall openings and additional smoke ventilation is not called for; pipe positioning is simplified; a pump with only a small capacity is needed; and there is considerable flexibility regarding the positioning of the HotFoam foam generators. Other benefits include simplified installation, since the low-weight generators can be hung directly in the supply pipes; simultaneous foam production over the entire protected area; and reduced emissions of smoke gases.

The system is now approved by the Dutch authorities for fire fighting in areas such as warehouses that contain hazardous materials. SP, the Swedish National Testing and Research Institute, has verified the system for ships' engine rooms, and HotFoam is now approved by all of the major maritime classification societies, including DnV [Det Norske Veritas]; ABS [American Bureau of Shipping]; BV [Bureau Veritas]; GL [Germanischer Lloyd]; LRS [Lloyds Register of Shipping]; RINA [Registro Italiano Navale]; and NMD [Norwegian Maritime Directorate].

Foam sprinklers for industrial applications

An alternative to the use of either Hi-Ex foam or HotFoam for industrial applications is a foam sprinkler system. This is where discharge heads are sealed with a frangible bulb or a fusible link, which breaks at a pre-determined temperature. Here, the discharge heads additionally serve as the detectors, and only the heads that are actuated discharge the foam in the local area, so minimising water damage. This type of foam firefighting solution is mainly used for flammable liquids or general warehouses, process plants and material handling areas.

A foam sprinkler system can also use what are termed "open head sprinklers". These are activated via a deluge valve for simultaneous operation of all of the discharge heads. This type of installation is more typically used to protect road or rail loading racks, aircraft hangars and horizontal storage tanks.

Historically, the main problem with foam sprinkler systems has been the accuracy of the foam proportioning. Traditionally, this had been difficult to achieve, as it was impossible to know how many discharge heads will operate in the event of a fire; the actual flow rate could not be predicted with any real degree of accuracy. This has been overcome by Skum with the development of a unique range of what are known as "wide range proportioners", both for bladder tank and pressure proportioning systems. These proportioners have been successfully used for the better part of ten years and are specially designed for ATC – alcohol type concentrate – foam concentrates, helping to ensure that a foam sprinkler system will function correctly under all possible operating conditions.

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Profile: Maritime Rescue Institute, Scotland

By **Hamish G. McDonald**

Director and Chief Executive Officer

Summary of Maritime Rescue Institute's scope of provision of advisory/ training programmes in maritime search and rescue operations.

Maritime Rescue Institute (MRI) is a Scottish registered charity

MRI is accepted internationally as having a wide scope of proven experience and operational capability summarised in the following:

- Development and running of training facilities offering advisory/training programmes covering a wide range of topics within the field of waterborne emergency response operations. The administration, content and provision of these programmes have been validated to agency, national and international standards.
- Development and provision of a wide range of advisory/training programmes, associated lesson plans, instructor guides, course notes and teaching aids.
- Formulation and undertaking of research and development programmes within the field of waterborne emergency response.
- Provision of consultative services supporting Governmental and civilian agencies in matters associated with waterborne emergency response.

MRI's Director and Chief Executive Officer, Mr Hamish McDonald was elected as a member of the International Lifeboat Federation's governing council (International Lifeboat Council) and he is chairman of that Council's Search and Rescue Development Committee.

Maritime Rescue Institute, Stonehaven, Scotland

MRI has a purpose built operational base at Stonehaven, Scotland. The base houses classrooms, changing rooms, administration offices workshop capable of housing vessels up to 20 metres and a café/restaurant.

Scope of MRI's activities

The geographic spread of work programmes undertaken

Africa, Americas, Australasia, Europe, and the Middle East.

Sample of clients

Lifeboat Institutions from:

Australia, Norway, Sweden, Germany, Holland, Iceland, Belgium, Spain, Portugal, Italy, Egypt, Ireland, Chile and United Kingdom.

Coastguard organisations from:

Canada, New Zealand, Japan, Denmark, Italy, Malaysia, Finland, Ireland, United Kingdom, United States.

Government Agencies from:

Canada, Germany, Holland, France, Spain, Norway, Sweden, United States, Italy, Belgium, South African, Uganda, Portugal, United Kingdom, Ireland, Japan, China, Singapore, Hong Kong, and Malaysia.



Methodology of working

MRI adopts the following overall methodology of preparation, development and presentation in relation to specific advisory support programme(s) provided to client(s).

Summary of services provided by MRI

Acted as advisory to:

Type of advisory/training services provided:

- Profiling operational analysis, risk assessment and definition of training, ongoing development and competency relating to waterborne emergency response and search and rescue.
- Development/review of waterborne emergency response groups.
- Development/review of waterborne emergency response craft and ancillary equipment.
- Development/review of the techniques for deployment and use of waterborne emergency response craft.
- Development/review of training programmes and the assessment standards of competence for members of waterborne emergency response groups.
- Development/review of operational strategy/tactics for use by waterborne emergency response groups.
- Development/review of legislative aspects relative to waterborne emergency response and associated matters.



- Development of prototype waterborne emergency response craft and ancillary equipment.

Projects managed

Over 350 Projects developed and managed ranging through:

- Development, test and evaluation of prototype waterborne emergency response craft from 5 – 24 metres, 25 – 85 knots.
- Development of test, condition and standards of waterborne emergency response craft for Governmental and commercial organisations.
- Development, test and evaluation of ancillary equipment and systems associated with waterborne emergency response craft.
- Development of test, condition and standards of personal protective equipment associated with waterborne emergency response craft operations for Governmental and commercial organisations.

Acted as expert witness to:

1. **The Royal Commission into the Ocean Ranger Marine Disaster**, Canada. Relating to: – emergency procedures, survival aspects and search and rescue activities.
2. **Legislative and Congressional Hearings, USA, into the Loss of The Glomar Java Sea** off Hainan Island, Vietnam/China. Relating to: – contingency planning, emergency procedures, survival aspects, international search and rescue activities, and political and military factors.
3. **Legislative Hearings, USA, into the Loss of the Sea Crest in the Gulf of Thailand**. Relating to: – contingency planning, emergency procedures, survival aspects, international search and rescue activities, political and military factors.
4. Investigation into injury to civilians during military activities in Northern Ireland.
5. Various formal inquiries relating to maritime and riverine events, nationally and internationally.

Example of the format of a specific advisory/training programme undertaken for an Overseas Government Agency.

- MRI assisted making initial determination of the implication of the political/operational statement of tasking for an operator, in terms of waterborne emergency response, leading to review/development of risk/threat/operational analysis and formulation of operational requirement. After definition of the operational requirement, definition of procurement requirement was made.
- MRI compiled a list of equipment that fell within the stated procurement requirement and submitted this list for final choice prior to purchase.
- MRI arranged the purchase of all equipment desired by the client.
- MRI defined then formulated training requirements for basic use and maintenance of the equipment. Additional training programs were developed for personnel chosen as potential instructors from within the operational group. The development of the training capability involved compilation of training courses, course syllabi, lesson plans, training aids, and instructor guides. The formulation of the training regime also involved the compilation of tests,



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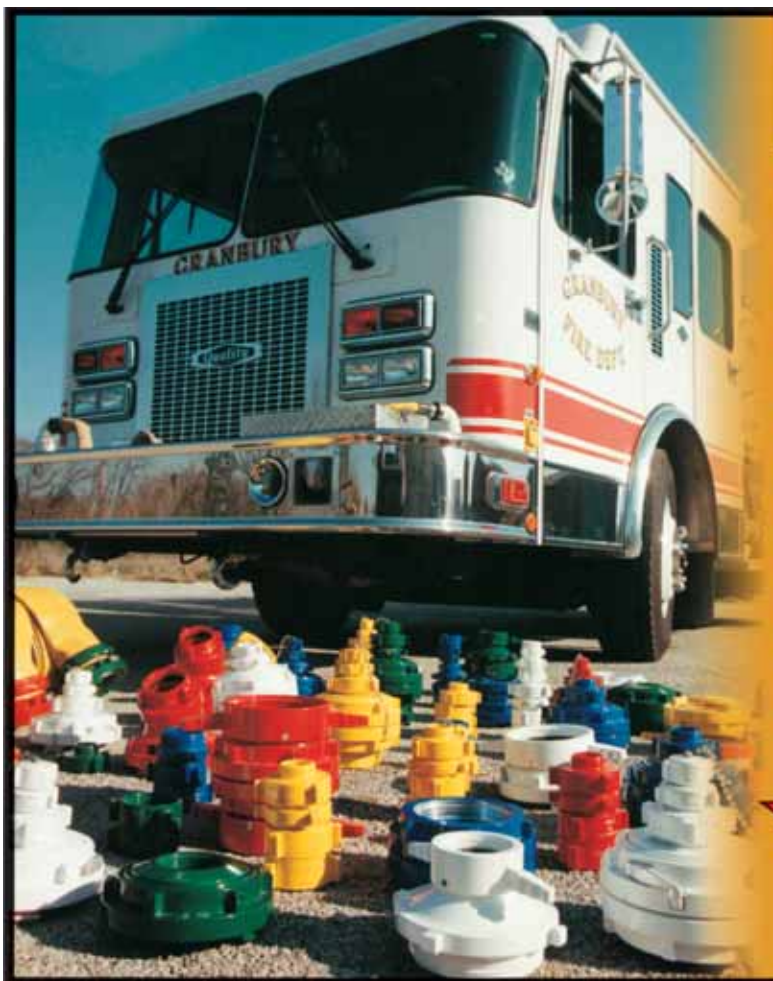
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conditions and standards set for trainees and instructors.

- MRI ran initial training course both for client's "base" personnel and those subsequently chosen as potential instructors.
- MRI, in conjunction with the client, developed scenario training.
- MRI, in conjunction with the client, made definition of overall personnel and equipment capabilities and limitations.
- MRI assisted the client in the definition then formulation of strategy of operation and tactics for deployment of the waterborne resource.
- MRI assisted the client in the development of advanced scenario training, advisory/cross training scenarios with other relevant groups/agencies.
- MRI assisted the client in the review of advanced scenario training; advisory/ cross training and real world activity involvement, this helped formulate continuous update of the risk/threat/operational analysis, operational requirement and subsequent updated procurement requirement, training requirement and logistic/maintenance support.

MRI's support package to the client, provided that client with a complete methodology and system which became totally self propagating and supportive. The programme allowed natural progression from external support to full internal system support, while continuously affording the highest level for client capability and potential.

Specific advisory/training programmes provided

Maritime waterborne emergency response, search & rescue operations:

- SAR Craft Operations
- Waterborne emergency response operations
- Surf zone SAR Craft Operations
- Inshore Rescue Boat Operations
- Airport Emergency Response Craft Operations
- Various courses relating to craft

Waterway awareness and swift water rescue operations:

- Profiling and Risk Assessment
- Waterways Awareness course (Basic/Advanced)
- Waterways SAR Technician
- Waterways SAR Coxswain

Code of practice for police craft:

- Offshore Rigid Inflatable Boat Handling
- Advanced Rigid Inflatable Boat Handling
- Small Inflatable Boat Handling

Maritime/inland waterway regions emergency response operations:

- Team Development
- Profiling risk analysis
- Command & Control
- Boat Operations (Basic/Advanced)

Specialist services:

- "Duty of Care" Profiling risk analysis
- Definition of operational, resource and training requirements

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- Development and provision of training requirements
- Development of lesson plans, instructor notes, teaching aids and trainee notes
- Training of training personnel.

NOTE: MRI holds lesson plans, instructor notes, teaching aids and trainee notes for all of the above programmes.

Relevant recent papers/reports presented

"Development and Use of Fast Rescue Craft" – Oceanography International Conference.

"The Offshore Maritime Rescue Project" – UK Department of Industry.

"Ergonomics of Fast Rescue Craft Operations" – The 2nd International Conference on Human Factors at Sea.

"Development and Use of Rigid Inflatable Boats". – The Royal Institution of Naval Architects.

"Physiological Aspects of Fast Rescue Craft in Terms of Initial Rescue and Care of Hypothermia Immersion Victims" – The 2nd International Symposium into Rescue and treatment of Hypothermia Victims, Cuxhaven, Germany.

"Practical Environmental Trials for Rigid Inflatable Fast Rescue Craft" – Journal of The Royal Institute of Naval Architects.

"Rescue and Initial Treatment of Hypothermia Victims using Rigid Inflatable Boats" – Royal Society of Medicine.

"Technical Factors relating to Survival Suit Evaluation" – International Immersion Suit Symposium, Aberdeen.

"Ergonomic and Medical Environmental Studies related to Rapid Intervention Craft Operations" (Joint paper with Dr. I.M. Light) – International Conference on Design Considerations for Small Craft, London.

"Development and Use of Rigid Inflatable Fast Rescue Craft" – US Coast Guard, USA.

"Potential role of Offshore Standby/Rescue ships" – Offshore Europe Exhibition, Aberdeen

"Development and Use of Rigid Inflatable Fast Rescue Craft" – Search and Rescue Week, EXPO 86, Vancouver, Canada.

"Operational perimeters and design considerations for fast lifeboats operating in heavy seas" – Search and Rescue Week, EXPO 86, Vancouver, Canada.

"Offshore Standby/Rescue ship Operations" – Leith International SAR Conference "Development & Evaluation Surf Capable Lifeboats" – US Coastguard "Development a specialist Rapid Intervention Craft" – Royal Institute of Naval Architects.

"Review of the Lord Cullen Report into The Piper Alpha Disaster" – UK Dept of Energy.

"Operation of Fast Rescue Craft from Offshore Rescue Vessels" – Royal Institute of Naval Architects

"The implications for training requirements of the introduction into operation of planning Lifeboats equipped with state of the art technology at a time when there may be general loss of indigenous longshoreman navigation and seamanship skills" – International Lifeboat Conference.

"Special training programmes for military and civilian waterborne emergency response organisations" – World Congress for Safety of Life at Sea.

"The use of profiling operational analysis within a specific methodology of working to ensure best prospect of safe and efficient operational capability" – International Boating and Water Safety Summit.

"Profiling and operational analysis as a means of assisting a sovereign state offer best prospect of compliance relative to implications of UNCLOS, Duty of Care and other legislative and civil requirements associated with waterborne emergency response" – International Conference of Safety in Transportation. Telesse Terme, Benevento, Italy.

"Implications of the present loss of traditional sea craftsmanship skills when developing training programmes for personnel involved in waterborne search and rescue." – SARSCENE, Halifax, Canada.

"The role of operational profiling as a tool for sea craftsmanship learning, and passing on experience to new lifeboat crewmembers" – International Lifeboat Conference, Cape Town, S. Africa.

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Swiftwater Rescue and Flood Response

By Jim Segerstrom

Special Rescue Services
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www.specialrescue.com

Update – 2006

2005: Business As Usual – Until August 29

In the U.S. in 2005 most of the media focus for 2005 centered around the response to Hurricanes Katrina and Rita, two storms that made landfall at a propitious time. Our officials had their eyes – and money – on the terrorism threat, the general opinion being that catastrophic flooding was something that happened primarily in Asia and third-world countries along the equator. We've known that wasn't true here in California, where over half of our major disasters have been floods, prompting the development of the first true swiftwater rescue teams in North America 25 years ago. And 2005 ended with yet another reminder that the global focus by emergency services on preparation for terrorism events may be misplaced.

Most of the Central Valley of California lies just at sea level. When the Spanish first came they found the valley full of native tribes living in vast marshlands, formed by the rich soil washed each year by the floodwaters from the Sierra Nevada mountain range. Since then a vast series of levees – 1600 miles long – has been built to retain and restrict the flow of the rivers. The reclaimed land has, unfortunately, been increasingly taken from agricultural use to provide ever larger cities. The levee system is an elderly patchwork owned by the Federal and state governments, small levee districts, and private farmers. In the past 20 years an increasing number of levee failures during floods should have set off alarm bells within our government, and fact-finding committees have met to come up with a plan to update the system, all reminiscent of what occurred in New Orleans. The state didn't do anything, (again like New Orleans,) and the resulting lawsuits laid the blame, and financial responsibility, for the major floods of 1986 squarely on the state government.

Since then California has developed one of the most sophisticated flood control and warning systems in North America. But emergency planners know that their best efforts won't prevent ALL floods.

And so again the levees failed on New Years Eve, inundating areas in several counties. Flood waters also rose in several coastal counties, leading to hundreds of swiftwater rescues by crews in boats and helicopters from our local fire departments and sheriff's search and rescue teams.

California has been aware of the potential for levee failures on a large scale for a number of years, and has prepared accordingly. What happened in New Orleans was no surprise to us.

Yet the massive flooding in Louisiana, Mississippi, and Texas has lead to a major examination of our nation's preparedness for such events – information that has been readily available for over 20 years, yet largely ignored by state and Federal officials more concerned with, first, responses to collapses, and now responding to potential terrorist attacks. Even though swiftwater rescue programs have been trying to focus attention on the discipline – all 50 states and all the provinces of Canada are flood prone – and despite the clear signs of global climate change, many disaster management officials in North America remained largely ignorant of the potential, as well as the availability of trained resources to respond to such events.

The sad result was the well-documented fiasco at all levels of government in the U.S. last August when Katrina came ashore near New Orleans, along with a continuing circular finger pointing and deflection of blame in many quarters. But one positive outcome has resulted: Flood response has once again moved into first place among the concerns of emergency planners in North America.

That focus is welcome by those of us who have been trying to get the attention of emergency planners – not only in the US, but globally. Weather-related events continue to outpace all other natural disasters in numbers and severity. There were 27 “named” Atlantic tropical storms in 2005, an all-time record, and the storm season lasted two months longer than “normal.” Seven of those that rose to hurricane strength made landfall from Mexico to Canada. One reached Category 5, Katrina.

Weather forecasters say that there is a 50% probability that at least four named hurricanes will make landfall in the U.S. in 2006, and one will be Category 4 or stronger.

The substantial changes in global climate have been covered elsewhere, including my previous article in APF (see APF September 2004, Issue 11), so will not be detailed again here. Suffice to say that as this is being written officials in the Phillipines continue to dig through a massive debris flow – a flood event – that has killed at least 1800. The monsoon season in Asia has been interspersed with wide-spread droughts in 2005, also extending months longer than “normal.” Floods in East Asia compounded the damage of earthquakes that had killed nearly 100,000. And today reports came in of massive flooding in Bolivia, with thousands missing in flash floods and debris flows in that largely arid land.

Katrina: “Lessons Learned”, Perhaps

Much beloved by the fire service are presentations at conferences on “lessons learned” from major events. When asked recently to present on the subject as regards to Katrina, I pointed out that there were already many such presenters out there; and that such a presentation by me would last about 15 seconds, to wit: “Not much.”

From my perspective, we've known the lessons for a long time. It is just that those that haven't taken benefit of our bad experiences routinely repeat them.

Then they get to speak on those very same lessons at other conferences!

Since climate change has been slow – insidious even – many emergency managers have chosen to play the odds, hoping that such disasters won't occur on their watch, concentrating their efforts towards responses they perceive as more likely.

Having been in New Orleans just before landfall of Katrina, attempting to deliver a swiftwater rescue course to personnel of the New Orleans Fire Department, I was keenly aware after only a few hours that they were completely unprepared, even though they served a city surrounded on three sides by water.

The ensuing chaos of the response was equally predictable. Local and state emergency managers had

little knowledge of swiftwater and flood rescue capabilities in their own area or in neighboring states, how to contact them, or how to use them once called. Even Federal officials dispatched to the area had little foreknowledge of the four distinctive phases of a major flood, or what would be needed to deal specifically with the problems of each phase.

Failure to implement existing plans; and lack of effective communications at all levels of government were the two major contributors to the resulting confusion.

Paradigm Shifts That SHOULD Result from Katrina

A "lesson learned" implies a lesson that one doesn't forget, at least not immediately. Certainly there were significant "action items." Whether anyone takes benefit remains to be seen.

- 1 Emergency management officials in many countries remain blissfully unaware that there is such as discipline as "swiftwater/flood rescue," with its own unique skills sets, requirements and equipment. As a young man working in the Nevada desert I was told by an old-timer that the way you train a jackass (the North American version of a donkey,) is to hit him between the eyes with a board first, just to get his attention. It shouldn't take that with emergency officials, but sometimes it feels like it.
- 2 Since floods occur in four distinct and COMPLETELY PREDICTABLE AND FORESEEABLE phases officials have a unique opportunity to stay ahead of events during flooding, if they only utilize available expertise in the swiftwater/flood rescue training community. In other words, they can actually MANAGE the disaster.
- 3 International response organizations could utilize the following suggestions that have been made to comparable US organizations:
 - a Identifying rescue resources in the jurisdiction, and then making that information available through an intra-state, perhaps even an international data bank;
 - b Cutting through politics to make sure that all potential rescue resources are list, not just fire service, and listing them as well. During Katrina the law enforcement SAR community in the US was largely ignored, because it was not an identified part of the Emergency Management Assistance Compact – a Federally recognized intra-state mutual aid program independent of FEMA.
 - c Starting with the pioneering efforts in California, "resource typing" needs to be extended to first a national and then an international model. Throwing rescue "stuff" at a disaster is inefficient and frequently ineffective, as exemplified by the Philippine debris flow. If local officials know what they are ordering and what those resources can do for them, the efficiency of the response rises dramatically. A "Type I Swiftwater/Flood Rescue Team" is now one of a number recognized description in the disaster plans of several states, and needs to be in all the rest.
- 4 Swiftwater/flood rescue resources need to be pre-positioned ahead of known storms. The "window" for "swiftwater rescues" is very narrow, only the first few hours of the event. There is no time to wait for the arrival of swiftwater rescue teams after the worst of the storm passes. But after those first few hours, floodwaters expand out a slower rate, and the problem becomes one of evacuations, rather than rescues. So highly skilled and heavily equipped swiftwater rescue units should handle flood evacuations, no matter how urgent, only initially. Those teams, should be withdrawn as soon as possible to be replaced by less comprehensively trained and equipped flood evacuation boat units. Swiftwater rescue teams can handle flood evacuations, but it is NOT necessary to have flood evacuation resources trained in swiftwater rescue.

Those swiftwater rescue teams deployed to New Orleans for periods as long as two weeks remained effectively out of service for several weeks thereafter, as they tried to replace destroyed and ruined equipment. During that period, Rita came ashore in Texas, and those units were unemployable.

- 5 Politicians and appointed officials in emergency services need to wean themselves of the concept of "national and international rescue teams," as a "first-in" or "elite" response. In the U.S. FEMA is belatedly attempting to determine a way to make the 15 year old Urban Search and Rescue Task Force system more responsive to floods – which have been proven many times more frequent than the major collapses to which the task forces were designed to respond. While many state and local USAR teams have trained and equipped for swiftwater responses, FEMA has limited itself to providing some equipment, and restricted the Federal Task Forces to "awareness" training for floods and "defensive swiftwater rescue" only. As the result, even though virtually all 28 FEMA Task Forces were deployed to the Katrina-devastated coastal areas, they had neither the equipment or training to deal with the widespread aquatic evacuations they faced.

- 6 We should re-visit the concept of the citizen-based emergency services of the Second World War, and concentrate money and effort to training local Community Emergency Response Teams in comprehensive and thorough "first responder" training, using the basic skills sets that have proven most effective in 90% of swiftwater rescues and flood evacuations.

I recently have had the privilege of providing village-level swiftwater/flood rescue courses in the Caribbean through the Florida-based charity FAVACA.

I have been repeatedly struck by witnessing the international projects to provide Emergency Operations Centers and high-level disaster management programs to national officials in countries with widespread communities with no fire engines, ambulances, communications, fuel, power or running water.

Most of the successful "saves" in major flood events, like all disasters, are made by locals and other survivors – whether trained or not. Basic swiftwater and flood rescue skills and equipment – delivered out into the community as far as possible – are a far better use of valuable aid dollars than centralized and complex "management" systems.

- 7 The U.S. model for Incident Command System training, now grandelocquently called the "National Incident Management System" actually works well. It works better than any other national "system" I've seen. Other nations would be well advised to consider it. It is designed to expand with the scope and scale of the disaster, and then shrink as the disaster winds down. It is field expedient, utilizing trained officials appointed to positions for which they have received the appropriate training, regardless of their "real-world" ranks, and designed so that ALL public safety agencies can work cooperatively.

The reason why it didn't work as advertised at Katrina? Simply because there remain many officials who only have paid lip service to the concept or who have been adequately trained in it.

- 8 Finally, there is a rising tide of opinion in the United States that the military should take over command of disaster response. Granted that they are the largest body of trained personnel readily available to most governments, "multi-tasking" them with disaster rescue hasn't worked well in other countries, and is likely not going to work as suggested in the U.S. In a support and logistics role, with smaller purpose-built rescue resources – such as our U.S. Coast Guard – it can work superbly.

However, disasters are a local event and with national consequences, and local authorities are – and should be – responsible for directing the response to large-scale floods.

The Reality for 2006

As this is being written the media in the United States continues to cover hearings in Washington attempting to determine what went wrong in 2005, and what changes to be made. The Secretary of the Department of Homeland Security has called for a permanent disaster staff of 15,000. The Defense Department is



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promulgating the military take command and control of Federalized disaster response. The states are stoutly defending their prerogatives to maintain command of local disasters, while insisting that the Federal government speed up its response.

In short, a circle of finger pointing, long-winded excuses, and deflection of blame.

The result will be some local increasing in training and staffing for swiftwater/flood rescue and boat operations. A few states will continue towards training and typing resources for local emergencies and EMAC-ordered responses.

But the political response will be a combination of hearings, extended planning briefs, and lip service to improving the national response system, with few substantial results by the end of the year. Dozens of excellent suggestions to fix the problems have been made, but there is no time for planning and implementation. FEMA, which has come in for the most criticism, will likely be reorganized, once again, but will still be as ineffective in 2006 as it was in 2005.

Floods will remain a national issue, but a local concern first and foremost.

The worst-case scenario for swiftwater rescue educators like myself, is not another flood, but a domestic terrorist attack, which will take the spotlight off of flooding yet again.

What's New?

While the political outlook remains bleak, response will become significantly more effective due to marked improvements in local preparations, public education, training for responders and improved purpose-built and designed equipment.

Standardized Training Globally

More local agencies are getting site specific swiftwater rescue training. I am personally aware that IRIA-certified courses for swiftwater/flood awareness, Technician, and management-level courses are increas-

ingly being taught in Asia, Europe and South America.

Another encouraging trend has been a growing emphasis on public agencies going to the private sector for specialized rescue training, which has in turn spawned a growth in the rescue training industry. The "train-the-trainer," or "cascade" concept – so popular with the fire service – has demonstrated flaws, particularly since it is based on the concept of novices teaching novices. Getting proficient to expert instruction results in more competent rescuers.

Webcourse Online Inc is now delivering a standardized awareness-level course in swiftwater rescue, written and directed by the author – using videos, flash drawings, lecture, and other materials – to make sure that responders in several countries not only receive the same materials, but have the use of the program for a year, so that they can take advantage of frequent updates. Further information is available by contacting info@webcourseonline.com.

Equipment Revolution

When we started the first swiftwater rescue course in 1979 the equipment – like the skills – was an accumulation from other disciplines: wet suits and fins from diving, life jackets from rafting and kayaking, helmets from skydiving and hockey, and so forth.

In the intervening 30 years equipment manufacturers have increasingly catered to each distinct rescue discipline with purpose-built equipment, designed to make the job more effective, efficient, faster and safer.

The RDC™ or "Rescue Deployment Craft" from Oceanid (www.oceanid.com) is one of the first of a new generation of inflatable rescue boats that were not built for another use and adapted for rescue as an afterthought. Weighing only 22 kilos, the RDC will fight in the side bay of a fire apparatus, can be carried in its bag to the water's edge by one person, and will fully inflate in a few seconds using a standard breathing apparatus cylinder. It can be paddled, set up on rope systems, comes with a specialized front shield that allows it to be



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The **Personal Retriever™** from **Life Safer** (www.lifesafes.com) is the first logical progression beyond the basic rescue throwbag and ring buoy in two decades. The foam covered device will easily deploy out to at least 25 meters, provides 5 kilos of positive buoyancy, and works surprisingly well in even fast moving water. One benefit of its buoyancy is due to the fact that during a flood event, the victims will generally not be wearing a flotation device; one of the downsides of the throwbag. And while the ring buoy may have more flotation, it can't be thrown nearly as far.

The **SRS Technician and Instructor Life Jackets** from Canada's **Force 6** (www.force6.com) have received wide recognition as the best built and most serviceable swiftwater rescue personal flotation device in the world today. In ratings conducted for a major fire magazine the Force 6 jackets easily surpassed similar designs from the United States and Great Britain. A new universal model designed for operations-level personnel is coming this year, and the other jackets will be fitted with a variety of extras, including an integral rescue harness for helicopter work.

Two of the major worries of swiftwater teams that are just now being adequately addressed have been proper footwear and fins that will work in river currents without being too clumsy. Solutions have been, as with so much other gear, the results of adaptation. In the case of footwear a wide variety of sandals, surf socks, wading boots, sports shoes and various designs of wet suit boots have been utilized. Because river currents are so much slower under the surface, traditional diving fins simply don't work efficiently, particularly when the swimmer is in the defensive swimming position – over on the back, feet downstream, and heels slightly lower than the buttocks. So swiftwater rescue teams have adopted the short-bladed fins designed for boogie boarding and body surfing in the ocean. The problem has long been that the fins – while excellent for river use – come with two small a pocket for most rescuers – particularly those with bigger feet. A challenge has been to get a manufacturer to make a short fin with a big enough foot pocket, and hasn't been done to this point because the rescue market hasn't been recognized as being as substantial as the recreational one.

The **Special Operations and Military Division of US Divers** (www.aqualung.com) has largely solved both problems with their well-built **Water Rescue Boots** and **Shredder Fins**. Unlike similar water rescue boots, these actually have a shank and good ankle support. The fins have a big enough pocket to actually fit over the built-on, steel-toed, boots so beloved by fire fighters in the UK and elsewhere; and have an additional "keeper" strap in case the main strap parts.

The brainchild of Dr. Mike Croslin, one of our original instructors in the early days of the Swiftwater Rescue Technician program, the **REACH™** from **Crossline Solutions Inc.** (www.crosslinesolutions.com) handily copes with a variety of situations that have vexed us for years in river work, namely how to capture a loose rope and get it back to us. The REACH can be thrown from the water or the bank, and when pulled clips and captures another rope. The REACH can be used to cross-clip a rope being thrown from the opposite bank, in order to get a line from side to side. I can be used in a variety of ways for rescuing victims entrapped in brush or debris. Applications for off-shore and helicopter rescue are in the works. The new rescue belt that is designed to go with the REACH provides further utility for the device, which is likely to become as much a standard piece of river rescue gear as the throwbag.

Drysuits have largely supplanted wet suits as thermal protection of choice for many swiftwater rescue teams. They keep the wearer warmer longer, don't present the

pressure problems of a wetsuit, and newer models are made of breathable fabrics and come fit with relief zippers and built-in socks. In the third phase of a major flood, the "slow-rise" phase, they also present an effective, if temporary barrier against contaminated water and hazardous material exposure.

Drysuits for swiftwater rescue use latex gaskets, as versus the neoprene of diving drysuit – for ease of repair and replacement, as well as because the wearer – theoretically – won't be diving under the surface more than a foot or two.

Drysuits come in a wide variety of designs, but all have the universal problems of gasket fit – particularly around the neck, for boat crews and land work – and are subject to puncture. **Mustang** has provided the first quantum leap in dry suit technology in a decade. The suit has the normal features, including built in socks and a relief zipper, (which may prove a bit small for some of our ham-handed rescuers,) but also comes with Kevlar padding for the shins and buttocks. The revolutionary feature, however, is the neck gasket, which is the first one that adjusts. The wearer can keep it loose enough for comfort, as well as to vent the suit, during dryland and boat operations, and then simply tighten the



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"bolero" bungee cords before going in the water. Skeptical at the outset, I've found this suit to be comfortable, warm, and resistant to pinhole leakage. But the neck gasket arrangement alone makes it worth the extra money the suit costs compared to many of its rivals.

Effective On-Line Training for Swiftwater/Flood Rescuers

Finally, on a personal note, I have been teaching swiftwater rescue more or less fulltime for 27 years. I've never grown tired of watching students discover the dynamics of practical rescue on the river, in many countries and a variety of languages. It is always exhilarating.

The same thing can't be said for the classroom portion of the course. Getting up to go over the same material repeatedly can sometimes be a test. I truly believe that the task of the instructor in such situations is to educate, and the root of that word is educare – to "pull out," from the Latin verb. Most rescue instruction works in the opposite direction, "pushing in" information. Instead, I'd as soon the student figures the concepts out with facilitation and guidance from the instructor.

The onset of Powerpoint has – in many circumstances – doomed effective educational delivery. Now inadequately prepared instructors can read the lecture notes off the big screen rather than their instructor's manual. Having words come in from the side, above, and below, cartoons, wavy squiggles, and all the other Powerpoint effects so beloved by speakers, don't enhance the presentation. They are simply embarrassments and frequently act as a more effective sleeping aid than a teaching aid.

Dynamic delivery, keeping the student interested and participating, using a wide variety of teaching aids, interspersing videos with lecture and perhaps discussion groups and table top exercises of real situation – all are accepted enhancements of effective educational programs.

Equally disheartening are most of the "on-line" pro-

grams that have been wheeled out. Conceptually sound, success has been mixed. The idea of saving time sitting in a classroom, with the resultant problems of having someone take the students place on the job while he or she is sitting in the classroom, makes "on-line" training, or training by use of a CD, a highly logical one.

So, using the technology I personally can give an enthusiastic lecture, with videos and a mechanism for discussion, to thousands of responders.

Webcourse Online Inc is now delivering a standardized awareness-level course in swiftwater rescue, **Safe Management of Moving Water and Flood Rescue Operations™**, written and directed by the author – using videos, flash drawings, lecture, and other materials – to make sure that responders in several countries not only receive the same materials, but have the use of the program for a year, so that they can take advantage of frequent updates. The program is available in any language. Further information is available by contacting info@webcourseonline.com.

Further information on any of the items above can be sought from the author at info@specialrescue.com or www.specialrescue.com

Next?

2006 will be marked by weather-related disasters and floods globally. While Avian Flu slowly spreads to the western hemisphere, killing a few hundred people in each country, approximately 300,000 people will die in floods. Most governments in the affected areas will respond ineffectually and too late. A major terrorist attack against a "soft target" in the west will again move the focus off of weather-related events. But other floods will follow.

And the climate will continue to warm.

The best advice for the reader? Don't wait for someone else to solve your flood rescue problems, or to take responsibility. Act now.

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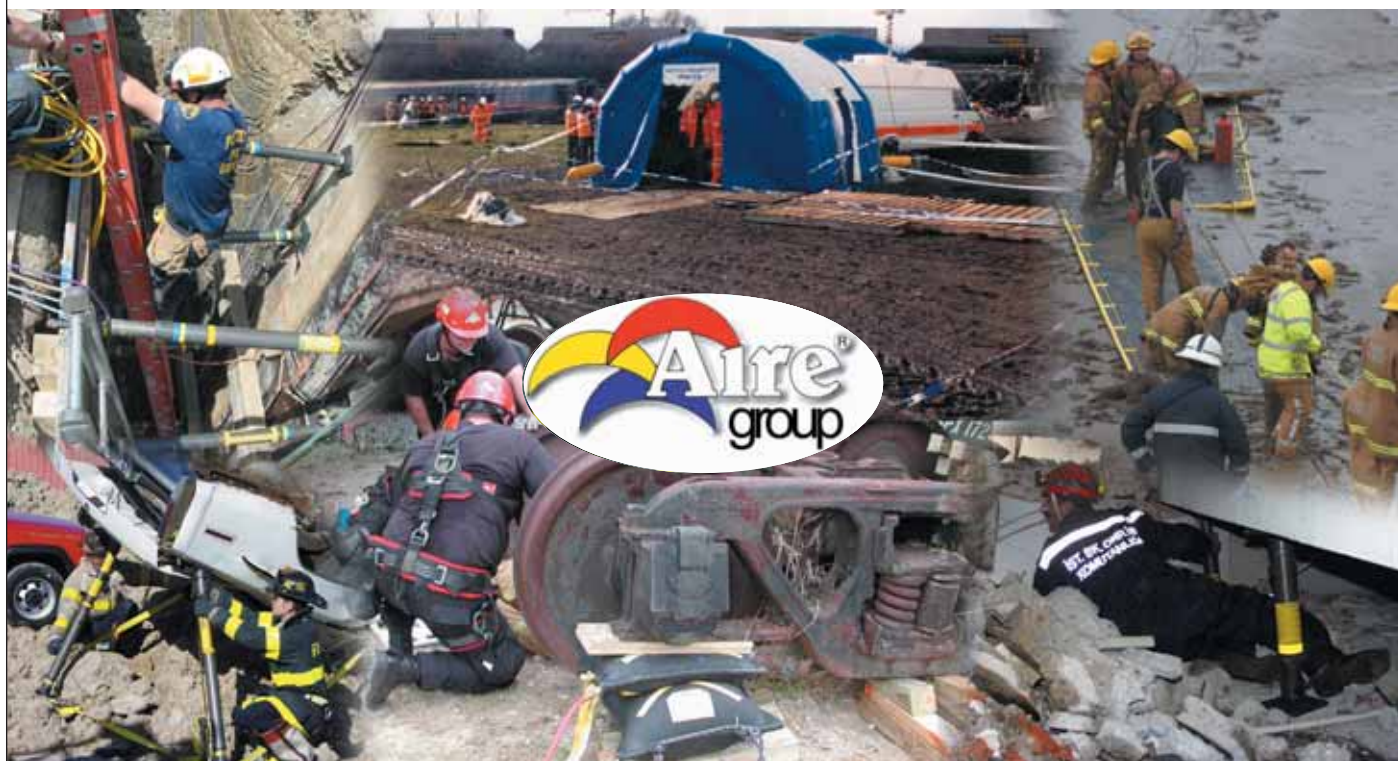
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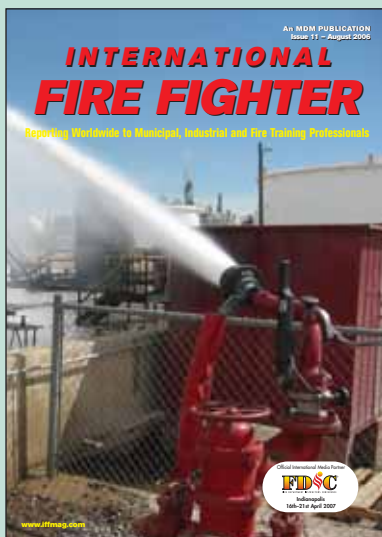
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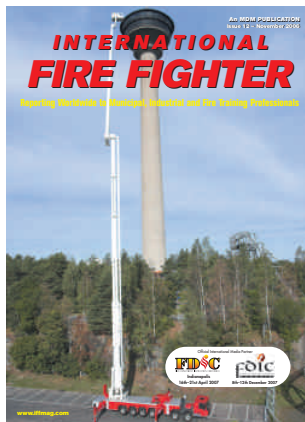
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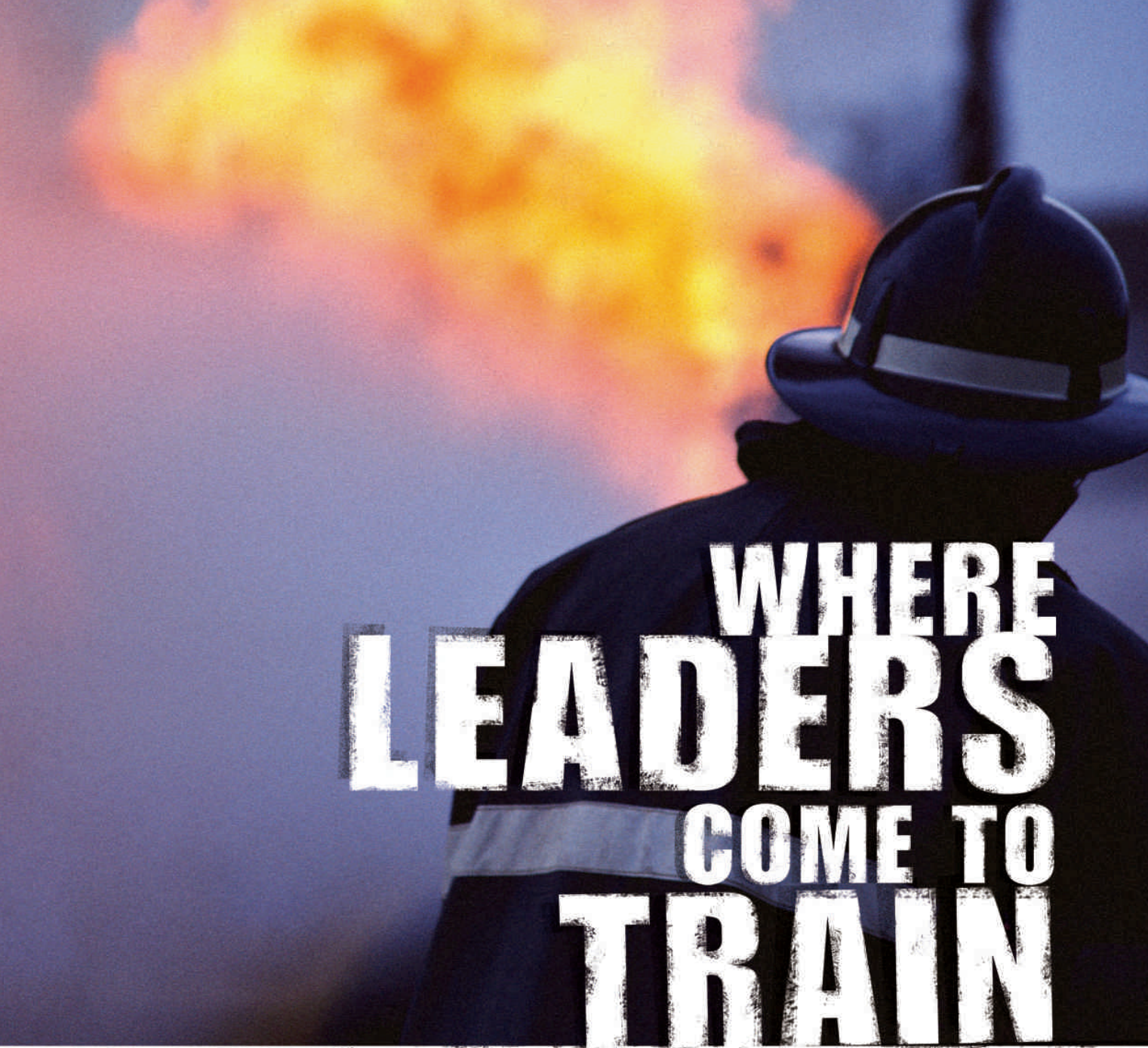
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Maintenance-free, low cost gas detection for up to 120 days with new Draeger X-am 1100 Personal Air Monitor

Ideal for short term or routine applications such as industrial shutdowns, the new Draeger X-am 1100 Personal Air Monitor provides up to 120-days detection of explosive gases and vapours, including diesel fumes, as well as oxygen (O₂), carbon monoxide (CO) and hydrogen sulphide (H₂S). Offering a cost effective, more convenient alternative to a rental device, this lightweight instrument eliminates the problems often associated with damage or loss and can simply be disposed of after use.

Completely maintenance-free and no larger than a mobile phone, the pre-calibrated X-am 1100 is easy to use. Designed for intuitive operation and featuring a practical two-key control panel and straightforward menu guidance system, it also benefits from a large liquid crystal display which provides all readings at a glance.

Incorporating the latest miniaturised XXS generation of powerful electrochemical DraegerSensors, the inclusion of a catalytic Ex sensor, calibrated to methane, also means that it can provide improved safety when facing unknown hazards. This sensor not only responds quickly to explosive gases but it also offers a high level of sensitivity to combustible organic vapours and, as a result, ensures dependable warnings in the event of explosive hazards.

Fitted with a crocodile clip for secure attachment to clothing, the ergonomic design features gas inlets on both the top and front to ensure that, even if it is accidentally placed in a jacket pocket, it will still provide a reliable warning against gas hazards.

In alarm situations, three different types of warning are issued. The audible multi-tone alarm is impossible to miss, whilst a visual 180-degree alarm helps to ensure that the warning is not ignored, as does the built-in vibrational alarm.

Dust and water-resistant to IP67, this rugged instrument remains fully functional and ready for use even after being dropped in water. The integrated rubber protection and shockproof sensors provide additional resistance to impact and vibration and the unit is also able to withstand electromagnetic interference.

The X-am 1100 can be used with either the standard alkaline or optional NINH batteries. In addition it can be fitted with a T4 battery, which can be recharged in the workshop or in a vehicle, whilst still inside the instrument.

Equipped with a data logger as standard, the unit allows data such as



alarms, errors and the results of function tests to be transmitted via infrared interface to a PC. The data can then be analysed using the DraegerGas Vision software. A variety of options are also available such as the Draeger E-Cal automatic test and calibration station, the Draeger Bump Test Station and optional user registration via the Draeger CC-Vision software.

Full details can be found at www.draeger-safety.com/x-am

Further information is available from:
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Park, Blyth,
Northumberland, NE24 4RG
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New Buncefield book features Angus Foam



A new book entitled "The Buncefield Explosion" features dramatic new pictures of fire fighting foam supplied by Angus Fire being used by fire crews to extinguish the blaze. Angus Fire is part of UTC Fire & Security, a unit of

United Technologies Corp. (NYSE:UTX).

The book is a photographic account of the incident that recalls the initial explosion, the column of black smoke above the site and how fire crews quickly extinguished the fires. Over 250 pictures are included in the book, many of which have never been previously published. Among them are images of the Angus Fire Emergency Service delivering urgently needed stocks of foam concentrate in bulk tankers and lorries carrying 1000-litre containers. Angus Fire Medium Expansion Foam Bund Pourers are also shown being used by fire crews to deal with the heat and flames.

The Angus Fire Emergency Service supplied

more than half a million litres of foam to Buncefield, mostly Angus Fire FP70. It has been delivering urgently needed supplies of foam to major incident sites worldwide for over 20 years and operates a dedicated 24/7 hotline (+44 (0) 15242 61166).

This fascinating book is published by Sceptre Education and is available at bookstores (ISBN 0-9552759-0-3) for £14.95 or by mail order (Tel: +44 (0) 870 950 6620 / Fax: +44 (0) 870 950 6621) for £14.95 plus p&p. Every book sold contributes to the UK National Fire Service Benevolent Fund.

Angus Fire is part of UTC Fire & Security, a United Technologies Corp. business unit that provides fire safety and security solutions to more than one million customers around the world. UTC Fire & Security is headquartered in Connecticut, USA.

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Website: www.angusfire.co.uk

Scott TYCO SCBA first choice for Petans

Scott Contour 300 – conclusive winner of training centre trials

SCOTT HEALTH AND SAFETY in conjunction with their regional distributor Tyco Fire & Integrated Solutions was awarded the contract to supply 90 x Contour 300 self contained breathing apparatus. (SCBA) and provide comprehensive service support to Petans professional safety and survival training centre at Norwich.

Universally acknowledged for providing the highest standards of training, particularly for the Offshore Industry, Petans General Manager-Michael Wilder commented, 'Many people consider Petans to be the best equipped centre of its type in Europe and we take pride in our ability to be adaptable to meet our clients needs.

When considering the acquisition of



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breathing apparatus, Petans had to consider many factors including ease of product handling for delegates and durability, quality of routine servicing and life expectancy. The demand on BA units is high as they are used daily on various fire fighting courses. These are principally for offshore and industrial response teams where the sets are worn by both experienced instructors and some 1000 candidates with varying knowledge and competencies. Therefore, in order to identify optimum sourcing for Petans we invited three BA manufacturers to tender and supply product to undergo rigorous trials and evaluation.'

Scott's Contour 300 fits the criteria

Petans instructors, some of whom are also in the municipal fire services, undertook the trials to determine which manufacturer could provide the best and most efficient units for use on site. Trials involved internal/helicopter fire fighting and confined space training.

Other review criteria included BA set compatibility with in the industry, ability to easily don and user comfort over long periods. The units must be robust to meet the constant demand on product, reliable and user friendly for both students and instructors who must complete product training within set time frames.

Petans Support Co-ordinator Les Briggs was involved in assessing the BA equipment and reported, 'The Scott Contour 300 is a single cylinder apparatus with a padded harness to ensure maximum wearer comfort and was acknowledged by the instructors as being the most robust SCBA with the most user friendly communications set. As the conclusive winner of the trials, a contract was awarded for ninety sets. It was agreed that all Petans instructors would be face-fit tested for the latest Vision 3 facemasks. This mask provides for excellent peripheral vision and was supplied with SABRECOM, Scott's intrinsically safe ATEX approved unique radio communications

interface. Delegates would be issued on arrival with the proven Scott PanaSeal mask which provides good all round face protection. Both Vision and PanaSeal facemasks are constructed from non-dermatitic materials and feature a side fit demand valve mounting and front speech diaphragm.

Local service – support

General Manager-Michael Wilder committed to green issues and supporting the local economy by reporting, 'When considering serviceability of the chosen BA sets and outsourcing, we were particularly keen to support the local economy and avoid unnecessary transport issues. Scott's distributor, Tyco Fire & Integrated Solutions is located here in Norfolk and can supply both the breathing apparatus, provide product training and a highly responsive, scheduled servicing of equipment.

We took delivery of the 90 Scott Contour 300 BA sets over 2 months ago and in view of the amount of harsh treatment the equipment undergoes, working hard sometimes 7 days a week, Petans can report no failures and would confirm that the products are performing beyond our expectations.'

Tyco Fire & Integrated Solutions provides a scheduled programme to fully service 25 Scott Contour BA sets and return them within 5 days. The sets are thoroughly steam cleaned to remove any hydro carbon, fully serviced and tested utilising hydraulic test equipment which provides a computerised print out covering leak test and performance.

Being in the locality enables Tyco Fire & Integrated Solutions to be flexible on deliveries and also respond quickly to any unforeseen servicing requirements

For further details relating to Scott Health & Safety range of respiratory protective devices and personal protective equipment contact for literature or visit www.scottsafety.com

New Nuclear Suit Represents Total Design Rethink

A new protective AF (Air Fed) suit for use in the nuclear and associated industries is announced by PROFESSIONAL PROTECTION SYSTEMS the UK's number one designer and manufacturer of decontamination systems and Air Fed Suits. Designated the NU2 it is described by PPS MD, Mark Whitcher as the result of a complete revaluation of the PPE needs of operatives in the nuclear industry.

"We jettisoned all received wisdom about what a suit should consist of and do and instead spent a long time with industry members, both management and front line, to find out exactly what was really required. The NU2 is the result" he says.

The new design is a PVC two-piece. This is to ensure maximum mobility as well as offering more component and cost options. The most striking new feature of the top half of the NU2 is the new configuration of the hood and visor that gives an unprecedented degree of all round vision. To prevent reflection into the hood visor the back is made of natural PVC. Great emphasis has also been placed by on the quality of the environment created in the suit for its wearer says PPS Designers Jacey Venables General Manager and Simon Eaglen Technical Manager. For this reason two non-return valves in the back of the hood ensure an excellent air exhaust flow. The air inlet is located in the front of the hood that also incorporates the unique PPS emergency breather system.

Two forms of glove fittings are offered- the PPS cuff system or the standard tape method used on nuclear sites. The top waist attaches to the trousers using a flap and button system, a tape however is added on a "belt and braces" principle.

The suit trousers incorporate a number of new features. For instance a generous amount of material is used in the design of the crotch area to ensure against ripping whilst bending or stretching whilst the security of the feet are ensured by welded on socks and an outer drip skirt.

NU2 is manufactured to BSEN 1073-1:1998 for the protection of clothing against radio active contamination and the part one requirements and test methods for ventilated protective clothing against particulate radioactive contamination.



For more information,
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Brigade gets £1.75 million training boost

LONDON FIRE BRIGADE is set to invest around £1.75 million in additional training resources for its firefighters.

At a meeting of the London Fire and Emergency Planning Authority on Thursday (September 21) it was agreed to fund the additional training and equipment which will further increase the expertise and safety of London's firefighters.

The extra investment will focus on the risk critical areas of breathing apparatus wearing, gaining real fire experience and incident command.

It will include funding for an additional breathing apparatus equipment, enabling the Brigade to establish an additional dedicated two day breathing apparatus 'continuation training course' for all firefighters and crew managers.

Continuation training is provided in addition to the 20 day breathing apparatus programme delivered to all trainee firefighters and the new two day courses will supplement the existing station based continuation training and assessments firefighters already receive.

Investment in an additional Real Fire Training Mobile Unit will ensure that all of London's firefighters have access to an annual 'real fire training' experience. The Brigade will now have two units which can travel to different fire station locations - giving firefighters the opportunity to practice

tackling different types of fire in a realistic but controlled environment alongside fire behaviour training.

Additional training for Crew and Watch managers on 'tactical decision making' during incidents will also be provided through a new two day residential course. The course will compliment existing training and ensure Crew and Watch managers' skills and knowledge are continually updated. A similar two day course for Station and Group managers will also be introduced.

London Fire Commissioner Sir Ken Knight said: "This extra investment is essential for the continued safety of firefighters and Londoners. The very nature of the service they provide means firefighters have to work in extremely hazardous conditions. We are always looking to further improve that service, while at the same time ensuring the safety of our staff is maximised.

"Enhancing the first class training our firefighters already receive in the three key areas of wearing breathing apparatus, real fire experience and incident command, will reinforce our ability to fulfil our key aim of making London a safer city while keeping the safety of our operational staff a priority."

Contact: Martin Simpson
Tel: 020 7587 4064 Fax: 020 7587 6086
Email: martin.simpson2@london-fire.gov.uk

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Torrent of interest in Ansul's new Thunderstorm Foam

TYCO FIRE AND SECURITY's ANSUL has teamed up with Williams Fire and Hazard Control Inc, probably the world's most highly respected specialist in the fire protection of flammable gases and liquids, to develop Thunderstorm ATC 1x3, a new generation of alcohol resistant AFFF foam concentrate. Specifically designed to fight fires in oil refineries, it uses new technology and has a dramatically reduced viscosity when compared with other 1 x 3-listed polar-solvent type AFFF concentrates on the market. This enhances the foam's performance in all types of foam proportioning equipment, including in-line eductors, balanced pressure systems and vehicle-mounted, built-in systems.

Thunderstorm can be used as a three percent solution on fires involving polar solvents, such as acetone, methanol and methyl ethyl ketone, and a one percent ratio on fires involving hydrocarbons such as high-octane petrol, aviation fuel and naphtha. These are the two most common types of flammable liquid fire that can occur in an oil refinery, and these low ratios simplify foam storage and dispersment around the site, and greatly increases the "staying power" of both fixed and mobile firefighting foam systems.

Other characteristics of the new foam include the speed at which it spreads across the surface of a tank fire and seals against the hot metal surfaces on the inside of the tank. Its excellent wetting characteristics also make it ideal for fighting Class A fires. High volume streams of Thunderstorm can be discharged from foam guns – located several hundreds of metres away from the tank – without causing turbulence when it hits the surface; the foam has good fuel shedding capabilities to extinguish the fire without knocking a hole in the foam blanket.

Thunderstorm extinguishes a fire in three ways. First, with a fire involving a conventional hydrocarbon fuel, an aqueous



film is created; in a polar solvent fire, a polymeric membrane is formed. This film or membrane creates a barrier to help prevent the release of fuel vapour. Second, regardless of the type of fuel, a foam blanket is formed that excludes oxygen and from which the liquids that form the film or membrane drain. Third, the water content of the foam produces a cooling effect.

Thunderstorm can be used with fresh, salt or hard water, and is formulated from special fluorochemical and hydrocarbon surfactants, high molecular weight polymers and solvents, and can be transported and stored as a concentrate. This ensures ease of use and considerable savings in weight and volume. Typically, aspirating discharge devices produce expansion ratios of between 5:1 and 10:1, while non-aspirating devices such as hand-line water fog/stream nozzles or standard sprinkler heads are between 2:1 and 4:1. Medium expansion discharge devices produce ratios of between 20:1 and 60:1, depending on the type of device and the operating conditions.

This latest addition to Tyco Fire and Security's fire safety offering confirms the company's status as a full solutions provider.

Further details on Thunderstorm can be found at www.ansul.com, or are obtainable by email on macron-info@tycoint.com, by telephone on +44 (0) 1493 417600, or by fax on +44 (0) 1493 417700.

RISC and Nutec go forward together as Falck Nutec BV

NUTEC ROTTERDAM BV, NUTEC DEN OEVER and RISC FIRE & SAFETY TRAINING BV have fully merged into one organisation and are going forward together under the new name of **Falck Nutec BV** from 2 October 2006.

Falck Nutec BV includes two brands: **Falck Nutec** organises safety training for the off-shore and shipping industry, **Falck Risc** offers training in combating calamities for fire brigades and the (petro)chemical industry.

Tens of thousands of students from all parts of the world train annually with Falck Nutec and Falck Risc. They make use of the unique training facilities on the Maasvlakte, which are perfectly suited for realistic practices.

Falck Nutec BV is part of the Falck Training division, a sub-division of Falck A/S in Denmark. The Falck Training division has 16 training and course centres in eight countries at the moment. Falck A/S, with 10,000 employees, is an international service provider in the field of auxiliary services, such as ambulance and fire services. Falck Nutec BV is led by Mr. Jens Hjorth, Senior VP Division Training at Falck A/S.

By bundling the expertise within Falck Nutec BV, we are able to broaden and deepen our provision of services even more at the Maasvlakte, Utrecht and Den Oever locations. Our clients are therefore assured of a wider selection of courses and training, from general training to specialist safety training.

Finally, the amalgamation of RISC and Nutec in Falck Nutec BV strengthens the innovating power of our organisation and forms the start of pioneering product and service developments.

For more information you may contact:
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Email: r.mildenberg@falcknutec.nl



Falck Nutec



Falck Risc



Leader Group UK is pleased to announce its new partnership with **Paratech Inc.**

We have been appointed the new **SOLE DISTRIBUTOR** for **Paratech Products** in the U.K. This will cover the full range of PARATECH RESCUE STRUTS, MAXIFORCE AIRBAGS, HOOLIGAN TOOLS, HAND TOOLS and WATER RESCUE PRODUCTS.

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The ethanol fire in Pennsylvania, October 2006

By J. C. Jones

Department of
Engineering
University of Aberdeen
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Ethanol has long been an important motor fuel. Henry Ford himself encouraged its use and the Ford Model T, the world's first mass produced car, was available as a version which ran on ethanol instead of on gasoline. Ethanol has an excellent octane rating, and in countries including the US there is a strong move towards ethanol-gasoline blends as motor fuel. Japan imports significant amounts of ethanol, for fuel use, from Brazil. There is the advantage that ethanol made by fermentation is carbon-neutral and therefore favourable in greenhouse gas emission terms.

Quantities of ethanol are therefore having to be transported, currently about 5 billion gallons per year in the US. In October 2006 a train bearing tank cars holding ethanol derailed in New Brighton PA, near Pittsburgh. Some of the tank cars finished up in the nearby Beaver River. Others leaked their contents, and fire and explosion resulted. There were no deaths or injuries, although many buildings had to be evacuated. All of this is reported in the October 30th issue of Chemical and Engineering News and no more is known to the present author. Having read that there was an 'explosion' however he is interested to speculate on the origin of it. A suggestion (no more: it might be refuted as more information on the accident becomes available) is that a tank car containing ethanol which had not leaked its contents at the derailment became heated by fire nearby and that a stage was reached where the pressure of ethanol vapour was greater than the tank car walls could withstand therefore a BLEVE – **boiling liquid expanding vapour explosion** – resulted. So understood a BLEVE is a non-chemical explosion, and of course water can display BLEVE behaviour in this way, for example when an autoclave blows up. If however, as in the case of the Pennsylvania accident, the exiting vapour is flammable a fireball will result if there is ignition, and the fire which caused the tank car contents to heat in the first place would provide a ready source of ignition.

According to the C&EN previously referred to

the tank cars in the accident each had a capacity of 30000 US gallons. This provides a route to estimating the size of a fireball which would have occurred had events been as described above. A widely used correlation for the diameter of a fireball is:

$$D = 5.25M^{0.314}$$

where M is the mass in kg of the substance leaked and D the fireball diameter in m. Now 30000 US gallons converts to 114 m³. Whilst occupying the tank car this would of course have been in the liquid phase, so to multiply by a value of 785 kg m⁻³ for the density of liquid ethanol gives a value for M, actually 89500 kg. Substituting gives:

$$D = 190 \text{ m}$$

so a fireball having a diameter around this value would have been expected. Were there any eyewitnesses who could comment on this? If this theory of the explosion is correct, will the incident find a place in the history of the subject as the first recorded BLEVE involving ethanol?

Henry Ford took the view that ethanol is 'the fuel of the future', a prophecy which is being fulfilled in our own day. Will the time come when ethanol is conveyed in pipelines instead of by road, barge or rail as at present? There will undoubtedly be a lobby campaigning, on safety grounds, for pipeline movement of ethanol as its importance as a liquid fuel increases.

IFF

ON THE USE OF THE TERM 'LIQUID EXPLOSIVES'

The author responded to many media enquiries concerning the 'liquid bomb' threat at Heathrow in August 2006 and broadcast on the topic on UK and Australian radio. He has had some feedback from someone professionally involved in explosives and would like to put his responses to that in the public domain by means of this note.

Some commercial explosives are of course liquids, probably the best known being nitroglycerine a.k.a. 'blasting oil'. However, the term liquid explosive can be extended to a pair of liquids which:

- (a) will react together exothermically, and
- (b) in so doing will create an overpressure.

Clearly in such a two-component explosive one liquid will be the fuel and one the oxidiser. The former might for example be mineral turpentine, the latter peroxide or bleach. Development work would establish what size and shape of vessel containing the mixed liquids would lead to an explosion with overpressure.

It is also relevant to note that detonation is not essential for there to be an overpressure. In detonation, of course, speeds are supersonic. However, a deflagration, in which speeds are sub-sonic, can have sufficient overpressure to cause death or injury to persons as well as damage to structures (e.g., an aeroplane fuselage). Hydrocarbon accidents in the refining and processing industries in fact lead to deflagration, not to detonation.

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Definitive guide to the new European Standard EN469:2005



Following the introduction of the new European Standard for protective clothing for firefighters, Bristol Uniforms, one of the world's leading manufacturers of firefighter PPE, has produced a definitive guide to the new standard for users, user organisations

(fire & rescue services), PPE procurement managers and other specifiers and purchasers of personal protective equipment.

A Guide to EN469:2005, available as either a printed booklet or CD Rom, is a comprehensive introduction guide to the changes which this new standard introduces over the previous standard EN469:1995. Within the guide there is a section covering the transition period and arrangements as well as its method of adoption across the member countries of the European Union.

Sections in the guide cover:

- Performance levels including the introduction of new clauses relating to heat transfer, resistance to water penetration and water vapour resistance, test methods and the introduction of two performance levels. A new 'heat transfer – radiation' clause uses a new test method with EN ISO 6942:2002 to replace EN366
- Sizing. The new standard refers to EN340:2003 for both size designation and marking
- Practical performance tests. Clause 4.5 now includes a requirement for ergonomic and practical performance testing
- Sampling and pre-treatment. Reference to PPE Directive 89/686/EEC Annex II Basic Health and Safety Requirements describes information to be supplied by the manufacturer and covers pre-treatment, cleaning, ageing and washing or dry cleaning
- Visibility. Remains optional but specifies the width and length of retro-reflective or fluorescent materials for different colours and types
- Whole garment testing. Clause 6.15 and Annex E refer to manikin testing procedures.

A detailed summary of the basic differences in requirements between EN469:2005 and its predecessor in Appendix A complete this in-depth guide for all those involved in firefighter PPE.

Commenting on this new standard and Bristol Uniforms' recent publication of its "A Guide to EN 469:2005", Dave Matthews, Convener of CEN TC 162/WG2 Heat and Flame Protective Clothing said,

Bronto Skylift launches a 101-meter unit

As reported in international press last year BRONTO SKYLIFT launches – again – the world's highest truck mounted rescue and fire fighting platform. The 101 m unit is the latest member of the famous HLA range, now covering the working heights from 69 to 101 meters. The HLA stands for High Level Articulated and represents the ultimate in high rise rescue and fire fighting capability. It goes higher and further than any other rescue and fire fighting vehicle.



The special features of F 101 HLA

Thanks to its relative low GVW of only 62 tonnes and it being mounted onto a 6-axle commercial truck chassis (with less than 4 meter transport height) instead of a trailer or special crane carrier, the unit has excellent manoeuvrability and drivability, making swift road transport possible, but giving access to high rise buildings. If required by the customer it is also possible to mount the unit onto 5-axle all-wheel drive crane carrier.

Setting up and operating is fast and convenient, thanks to features like H-type outriggers with only 8 meters total jacking width, automatic (all jacks simultaneously) jacking, automatic levelling, full secondary control at the turntable, automatic erection and automatic drive into transport position. The integrated waterway facilitates immediate and efficient extinguishing.

One of the most important features of the F 101 HLA is without doubt the Bronto Skylift Bronto+ control system, which is geometry

based and (unlike any other control system on the market) gives exactly identical outreach under all circumstances, regardless of external influences: temperature, dynamic forces, friction, etc. Fault finding and full remote diagnostic system (Bronto TeleControl) is part of the standard delivery.

The Bronto Skylift F 101 HLA gives maximum work efficiency and return on investment

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For more information please contact:

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Website: www.bronto.fi

Main operating data

Max. working height (depending on transportation height)	101 m
Max. height to working cage bottom (depending on transportation height)	99 m
Max. working outreach	28 m
Working outreach at all heights from ground level to 65 m above ground level, approx.	23 m
Max. working reach below the ground level	7.8 m
Safe working load (without water discharge)	400 kg
Max. nominal water discharge capacity (with adequate supply pressure)	3800 l/min
Rotation, continuous	360°
Transport height	4.0 m
Transport length	17.1 m
Typical weight with chassis, G.V.W. (standard specification)	62 t

"It is good to see manufacturers' carrying out their obligations under UK PPE Regulations and EU PPE Directives. The information provided needs to inform the user, with particular emphasis on the EU PPE Directive, Annex II Basic Health and Safety Requirements. Too many manufacturer's/suppliers are unaware of the requirements to supply information with their PPE."

Roger Startin, Bristol Uniforms' joint Managing Director added, "Revisions to standards take time to develop and achieve consensus so events such as this are, of necessity, infrequent. Given the significant pace of fabric innovation over the last 10 years, and the parallel garment development work which manufacturers

such as ourselves have invested in to introduce higher performance PPE, the importance of this revision prompted us to introduce this guide as an aid for all those involved in implementing its requirements".

For more information about Bristol Uniforms or Bristol Care™ please contact either:

Roger Startin, Bristol Uniforms Ltd
on 0117 956 3101 or email
roger.startin@bristoluniforms.co.uk
Or **Richard Storey, RSL Associates**
on 01749 870652 or email
richard@rslassociates.co.uk

World Success for Speedings

Speedings of Sunderland, UK manufacture and supply Kevlar Lined Sharp End Protection Systems to 70% of the UK fire and rescue services. The company has been working closely with the fire services over the last decade to develop safety products that meet the needs of emergency service personnel when working at Road Traffic Collisions or other incidents involving entrapments.

The system utilises Kevlar technology to provide maximum protection for the rescuers and the casualty during an incident. The Kevlar ensures that the risk of an injury being received is minimised to an acceptable level, should anyone come into contact or fall against the cut metal. The outer lining of the products is made of highly visible, orange or yellow material, which conforms to EN 471 (European Standard for Conspicuity) and is coated to provide resistance to body fluids. The products can be washed in a domestic washing machine that ensures that they can be properly cleaned and put back in service in the shortest possible time.

The current World (New Zealand) and UK (Brighton) Extrication Champions have been using Speedings products for some time and team captain Shaun Moody from South Wales Fire and Rescue Service said:

'As World Extrication Champions we recognise that the safety of rescue teams and casualty is paramount – that's why we use Speedings Kevlar Lined Sharp End Protection both in competitions and at every RTC we attend – it's simply the best. The customer service we receive from Speedings is second to none.'



Speedings Kevlar Lined Sharp End Protection in use at the UKRO Extrication Competition in Brighton UK during July 2006



During FDIC Speedings gave away a set of Kevlar Lined Sharp End Protection, the winner being drawn by International Firefighter Publisher David Staddon

Further details on all Speedings products can be obtained from:
www.speedingsltd.co.uk
or by calling
0044 (0)191 523 9933

Following the phenomenal success in the UK the products were launched into the USA at FDIC in April this year. *'The response from the show was astounding, the booth was constantly swamped with firefighters interested in the products. It was quite remarkable the interest received from the firefighters visiting the show,'* commented Joe Hammal, Speedings Managing Director.

The decision to launch the product into the USA was taken following the reaction to the products received from an American Chief visiting a UK fire show. *'Having been introduced to the Speedings Kevlar Lined Sharp End Protection System, I was able to recognise the quality, and realise the protection that it gives firefighters – I was the first Chief of Department to buy the product, but I'm sure I won't be the last!'* said William Peterson – Chief of department (Retired), Plano Fire Department, Texas.

Following interest from around the UK and Europe, Speedings are currently working with Urban Search and Rescue (USAR) Teams to produce a series of protective covers for the protection of crews against reinforcing bars exposed and cut during search and rescue operations. **IFF**

The explosion in Clydebank, October 2006

Early on the morning of Tuesday 10th October 2006 there was an explosion in a building in Clydebank, Scotland which comprised two adjacent retail outlets, one in use as a hairdresser's and the other as a 'sun-bed shop'. The buildings were unoccupied at the time of the blast and the nearby streets empty, otherwise the consequences might have been much worse as there was a great deal of flying debris from the explosion. Even so the nearby roads were still blocked off when commuter traffic began several hours after the explosion.

By J. C. Jones

Department of
Engineering
University of Aberdeen
j.c.jones@
eng.abdn.ac.uk

The most remarkable feature of the incident was the blast damage. The two shops were destroyed and there was a knock-on effect to a third one. There was therefore obviously a significant overpressure. The formal background in the shaded area below on overpressures in combustion will take our discussion forward.

A detonation always involves a major overpressure. High explosives such as TNT display detonation behaviour. Hydrocarbon accidents due to leakage and ignition usually result not in detonation but in the less vigorous form of 'combustion wave', the deflagration. A deflagration may or may not display an overpressure: whether it does depends on such factors as the intrinsic reactivity of the reacting material and the degree of turbulence. Turbulence is promoted by obstacles and by confinement. However, a deflagration cannot display an overpressure as high as that at the centre of a detonation. Overpressures of the order of 0.1 bar are necessary for there to be structural damage to buildings. Overpressures a tenth of that can cause glass damage. The overpressure profile during an explosion can be deduced by inspection of the resulting damage.

The shops destroyed by the Clydebank explosion were of course supplied with natural gas, and the possibility that leakage of this had caused the accident has to be considered and weighed against the evidence. Suggestions that natural gas leakage did cause such extensive blast damage are counterintuitive. Methane is the least reactive in the alkane family of hydrocarbons, so the 'intrinsic reactivity' requirement for overpressure to accompany a deflagration is less likely to be fulfilled for methane than say for propane or for butane. Natural gas supplied to a device such as a gas tap or domestic cook-top is at a pressure only slightly above atmospheric. On encounter with air it therefore lacks a high degree of momentum and mixing is predominantly by natural buoyancy effects whereas for an overpressure rapid mixing, expressible as a degree of turbulence, is required.

These considerations are in conflict with any suggestion that a natural gas leak caused the Clydebank incident. In any case it is quite possible that damage examination will reveal that there were overpressures which only a detonation could have caused. Before we turn to 'what the papers say' about the incident some days later one suggestion as to the cause will be made by the present author. It might well be that evidence is already available to the investigators whereby the suggestion can be dismissed, in which case the scientific interest of the suggestion to readers of this periodical remains. If during propagation of a fire in one of the shops a piece of soft furnishing or a carpet had been ignited, it is likely that because of restricted oxygen availability burning would have been accompanied by an abundance of thick smoke. This would have been rich in combustible breakdown products (many of them far more reactive than methane!) which will form an explosive mixture if oxygen availability is enhanced, for example by collapse of a door or breakage of a window. This is a well documented phenomenon in fire dynamics, known as a 'smoke explosion'. During the build-up of smoke prior to such an explosion there will have been deposition of it on to windows, so inspection of glass fragments from the explosion can be examined for such deposition the presence of which is indicative of a smoke explosion.

If the 'smoke explosion' theory won't do there remains the possibility that a high-explosive device was intentionally placed at the scene of the incident and suggestions to that effect are being made by the newspapers at least one of which goes as far as to say that a gas explosion has been 'ruled out' as the cause.

We might note in conclusion that there was a highly serious gas explosion in the same part of the world 35 years ago. It occurred at a shopping precinct in Glasgow, and there were 20 fatalities and 100 non-fatal injuries. At that time the UK was changing from manufactured gas to natural gas and it was in fact manufactured gas that had leaked. This is powerfully destructive on explosion by reason of its hydrogen content.

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Pic courtesy of Reuters

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*Aerial ladder platform
fighting a fire in
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Turntable ladders and aerial ladder platforms

The turntable ladder concept has already been known and used everywhere in Europe for the last 150 years. The old turntable ladders were dangerous, unstable and flimsy – yet they offered the only “high-rise evacuation system” in those days. The straight ladder was, and still is, naturally not suitable for rescuing from behind roof corners, parapets, chimneys or any obstacles. It had no, as we call it, up-and-over capability at all.

By Merja Viilola

Only in the early 1960's a competitive concept, namely articulating hydraulic platform, was created. This new concept offered a small cage for limited rescue operations and the articulated boom design made higher rescue heights possible. The initial hydraulic platforms were rather heavy and robust in construction and required a heavy chassis. The traditional turntable ladders being lightweight, nimble and cheaper were still in a dominating position, especially among smaller fire services who could afford only one vehicle. The articulated platforms were, and still are, used mainly by fire brigades in major

metropolitan cities where over 50-60 m high rise rescue capability is required. When rescuing from the great heights, the articulated design enables the ultimate reach – both horizontally and vertically.

When the years passed, the duties of Fire Brigades changed from the fire fighting more to rescuing people. In the early 1980's, it was Bronto Skylift who combined the turntable ladder and hydraulic platform concepts into Aerial Ladder Platform concept. The design was developed after a detailed study of the use of both turntable ladders and hydraulic platforms, and after an

Aerial ladder platforms are ideal for narrow streets and congested areas



extensive testing with a prototype model. The design concept made its international debut in UK in 1986 and was shown by Bronto Skylift at the Fire exhibition of that year.

Aerial ladder platforms have all capabilities of the former concepts, and besides they offer extensive outreach, up-and-over capability as well as rescuing by the ladder and with the rescue cage. The operational benefits are clear: continuous rescue capability by use of the boom ladders for high density evacuation emergencies. The boom ladders are rigid and wide with high handrails thus



The platform boom design enables rescuing from behind roof corners or any other obstacles

offering maximum confidence to those using them. A large cage for rescuing the elderly, infirm and children or anybody too frightened or injured to go down a ladder. The aerial ladder platforms have larger rescue cage as well as higher cage capacity as the old hydraulic platforms. The rescue cage can be turned to each side from its centre position to provide safety, efficiency and comfortability in rescue operations. The integrated waterway and fixed water monitor in the cage offer more safe and efficient way of extinguishing large fires than the conventional turntable ladders where the fire hose has to be manually pulled up. The integrated waterway and remote controlled water monitor make also unmanned extinguishing possible in case of extensive fires with the danger of explosion. Additionally, with the availability of compressed air, electric powerline, hydraulic pressure, breathing air and the fold-down rescue platform on the front, the cage is also extremely valuable for the rescue operations. With the above mentioned power supplies available in the cage a wide variety of electric, compressed air and hydraulic power tools can be operated from the cage. Also other means of rescue systems can be used for added operational versatility: rescue chutes, winches etc.

The telescopic boom design makes the operating of the aerial ladder platform easier, especially in narrow streets or confined areas. The boom design also permits the cage to be positioned below ground level which provides additional flexibility for rescues from rivers, embankments, canals, docksides etc. The appliance can be operated through 360 degrees (to front, rear and both sides) even when the outriggers are in the inboard position. The rotation ability had always been considered as one of the biggest advantages of the turntable ladder.

Along with the superior rescuing capability, the aerial ladder platforms have another clear advantage compared to the conventional turntable ladders or the hydraulic platforms: the dimensions. Compared to the old hydraulic platforms the aerial ladder platforms are extremely compact and thus fast and easy to operate in traffic. There is no rear or front overhangs so there is no danger of damaging the booms to the front or the cage positioned at the rear as with conventional hydraulic platforms.

Once the operational benefits of this pioneering innovation became clear, the impact on the acquisitions and fleets of rescue and fire fighting services was dramatic. The aerial ladder platform has also been referred to as "ladder killer", in the sense that it took almost all markets from the traditional ladders. It has made the conventional turntable ladder obsolete by being more versatile in operation, and it enables practically all tasks of a modern rescue service to be performed with one aerial appliance only. This concept has displaced both hydraulic platforms and turntable ladders in Scandinavia, UK and many other areas in Europe. The concept has helped rescue services to obtain financial packages and in fact, in certain countries this development has stopped financing from being available for purchases of conventional turntable ladders. In UK it has taken over the market, and alone in German speaking European countries there are several hundred units.

The aerial ladder platform concept has proven

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Above all

The aerial ladder platforms are extremely compact and thus fast and easy to operate in traffic and accident scene



to be extremely valuable in dealing with incidents such as evacuation of hotels or offices, minimizing the damages to historical heritage building without built-in fire prevention systems, handling major industrial fires at chemical plants and refineries, assisting as lighting masts, lifting injured people from a traffic accident at a below ground

level position, assisting with surveillance work by remote control at a major industrial blaze where there's a high risk of explosion etc. These are just some examples of incidents where an aerial ladder platform has been proven to be more versatile, effective and safer than conventional turntable ladders.

One further big advantage that the aerial ladder platforms have over the conventional vehicles is the training. Most operators find that learning to operate the aerial ladder platform is easier than that of the ladder, and of course the rescue training is more practical. The training officers feel that the design of the equipment and the simplicity of the control systems are particularly user friendly and more importantly that the built-in safety systems and interlocks prevent damage and possible accidents in the early days of gaining operational experience.

The trouble shooting and adjustment of operational parametres of the aerial device can be performed by the aerial manufacturer through GSM network.

During the 20-year-long history of the aerial ladder platforms the design has also been developed further. One of the biggest steps was introducing the computer based control system. This advanced system informs the operator the possible outreach immediately after having set up the outriggers. The operator can determine – without lifting the ladder set – whether or not a particular aerial object can be reached. The system displays all operational parametres such as the chosen max. rescue cage load, the outreach and height, the boom angle, the wind speed, and additionally it gives full trouble shooting information. The trouble shooting and adjustment of operational parametres of the aerial device can be performed by the aerial manufacturer through GSM network.

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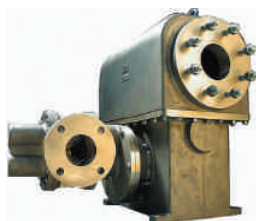
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Choosing a Nozzle

By Tom Rodgers

VP of product development, Akron Brass Company

What Nozzles Do

Nozzles are designed to help put out fires by getting the right amount of water, in the right form, in the right place.

Nozzles have three main functions:

- **Control Flow**
The size of the orifice in the outlet of the nozzle controls the flow.
- **Provide Reach**
The nozzle creates a restriction at the end of the waterway, which changes water pressure to velocity. Velocity provides the reach, which is necessary to get the water to where it is needed.
- **Create Shape**
Different situations require different methods of applying water or foam. Some situations require the reach and penetration of a straight stream, while others require the heat adsorption capability or radiant heat protection of a wide angle fog spray.

Nozzle Options

There are five basic nozzle types: **1** the solid bore; **2** the single gallonage (sometimes called variable pressure/variable flow); **3** the adjustable gallonage; **4** the automatic or constant pressure; and **5** Multi-Purpose Nozzle (combination solid bore and fog). Of the five, the latter four make up a group of nozzles commonly called combination nozzles because they produce both a straight and a fog stream.

Solid Bore Nozzle

The solid or smooth bore nozzle is the most basic of the four nozzle types, both in design and function. Its purpose is to produce a solid stream, which provides maximum reach and penetration.

Single (Fixed, or Variable Pressure/Variable Flow) Gallonage Nozzle

The single gallonage nozzle, the simplest form of the combination or fog nozzle, provides flow at a predetermined rate that cannot be altered significantly while in use. However, when the nozzle pressure is varied the flow varies. Some of today's single gallonage nozzles can provide quality patterns even at reduced nozzle pressures.

Adjustable Gallonage Nozzle

Today's adjustable gallonage nozzles allow the nozzle operator to manually select a desired gallonage without shutting down. Like the single gallonage nozzle, some of today's adjustable gallonage nozzles can provide quality patterns even at reduced nozzle pressures.

Automatic (Constant Pressure) Nozzle

An automatic nozzle is designed to maintain a relatively constant pressure over a wide range of flows. This is accomplished by a mechanism in the nozzle that automatically adjusts to an increase or decrease in flow to maintain pressure, and thus



reach, fairly consistent. However, these nozzles can give you consistent reach while sacrificing flow.

Multi-Purpose Nozzle

A combination solid bore and fog nozzle, provides maximum reach and penetration, while still enabling the benefits of a fog stream at the same time or independently. This versatile nozzle has the ability for large flows at reduced pressures, and is well suited for multiple applications: interior, exterior, and high rise attacks, CAFS systems, foam applications, direct and indirect attacks, cooling, protection, and ventilation.

Selecting a Nozzle

When selecting a nozzle it is important to choose the type that is best suited for your applications. The following guidelines will help you determine which type and size of nozzle is best for you.

1 What flow range is required?

A nozzle cannot create flow. The available water, pump capacity, hose lays, etc., determine what a nozzle can achieve. The system needs to be analyzed to determine what flow range can be achieved.

Determine the maximum flow rate that can be achieved with normal engine pressures and hose lays.

Determine the minimum flow that will be required.

Consider whether the nozzle will always be used on the same hose or whether it will be used in other applications, which might require different flows.

2 How much flow can be controlled by the available manpower?

Reaction force is determined by the GPM flow, nozzle pressure and pattern. First determine the maximum flow that can be controlled by the available manpower.

3 Are different patterns required?

Decide whether a solid bore nozzle or fog/straight stream nozzle is required. Quality fog nozzles produce almost as good a straight stream as a solid

bore nozzle but do require a higher inlet pressure. The reach of a quality fog nozzle at 100psi is about the same as that of a solid bore nozzle at 80psi or a multi-purpose nozzle at 50psi.

If the lower pressure performance of a solid bore nozzle combined with the patterns of a fog/straight stream nozzle would accommodate your needs best, consider a multi-purpose or break apart fog nozzle with the compact solid bore tip.

Fog nozzles are designed to provide a dispersed stream to protect personnel. Teeth are provided to break up the water into smaller droplets for better heat absorption and steam effect. Spinning teeth provide excellent breakup of water for heat absorption and steam conversion, due to the elimination of fingering, which is especially important in LPG type fires.

4 Who should control the flow – the nozzle operator or the pump operator?

Determine whether it is necessary to change the flow rate while operating. If so, decide whether the nozzle operator or the pump operator should control the flow rate. If the nozzle operator should control the flow rate, an adjustable gallonage nozzle could be the best choice. If the pump operator is to control the flow rate, a single gallonage (fixed, or variable pressure/variable flow), an automatic nozzle or a multipurpose nozzle would probably be the best.

5 How durable should the nozzle be?

Nozzles are designed to withstand reasonably tough service, but some nozzles will withstand more abuse than others. If durability is crucial and maintenance and repair opportunities are limited, a less complex nozzle design might be the best choice because the simplest nozzles are usually the toughest.

6 What is the level of training?

Departments provide various amounts of training for the pump operator and the nozzle operator. The nozzle should complement the training. Solid bore nozzles require the least amount of training for the pump operator and the nozzle operator. The engine pressure depends mainly on the length and size of hose.

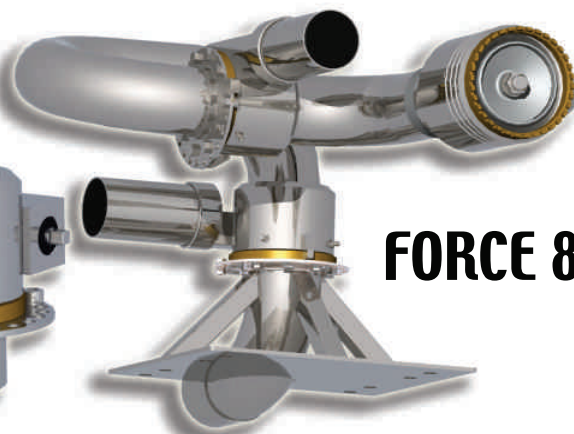
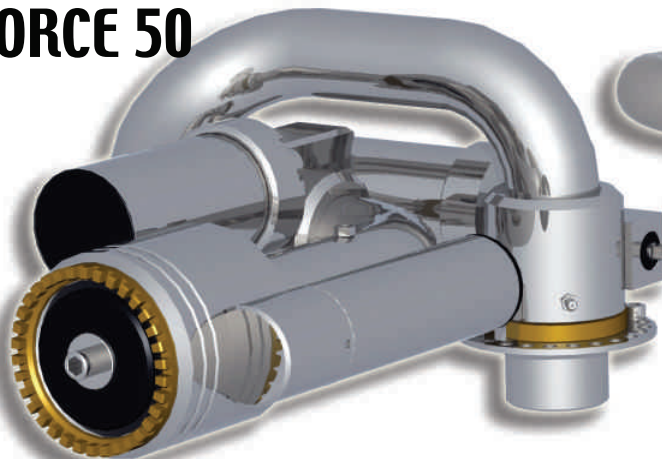
Single gallonage or variable pressure/variable flow nozzles require somewhat more training than the solid bore nozzle.

Adjustable gallonage fog nozzles require additional training of the pump operator and the nozzle operator because different engine pressures will be required for each of the flow settings with different lengths and sizes of hose.

Automatic/constant pressure fog nozzles also require additional training of the pump operator and the nozzle operator. The pump operator must be trained to accurately control the engine pressure and flow with different lengths and sizes of hoses and different operating conditions. Multi-Purpose nozzles require additional training for the nozzle operator, because they must be trained to use the multiple shutoffs on these nozzles.

After analyzing a departments needs and considering the strengths and purposes of each nozzle, decision makers will be better prepared to choose how to spend their limited resources on the right combination of nozzles.

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How to Specify a Fire Hose

Fire hose is perhaps the most important piece of equipment carried on a fire appliance. It is the fire fighter's lifeline. That is why it is so important for buyers to specify fire hose that will not fail at a critical moment. This is becoming increasingly difficult, however, because of the growing number of fire hose products on the market. While many may look like the leading products, appearances can be deceptive! And what do the performance levels and independent approvals claimed by manufacturers and suppliers really mean? Here Clair Maxwell explains how to specify a hose that can be relied on to give long and dependable service.

By Clair Maxwell

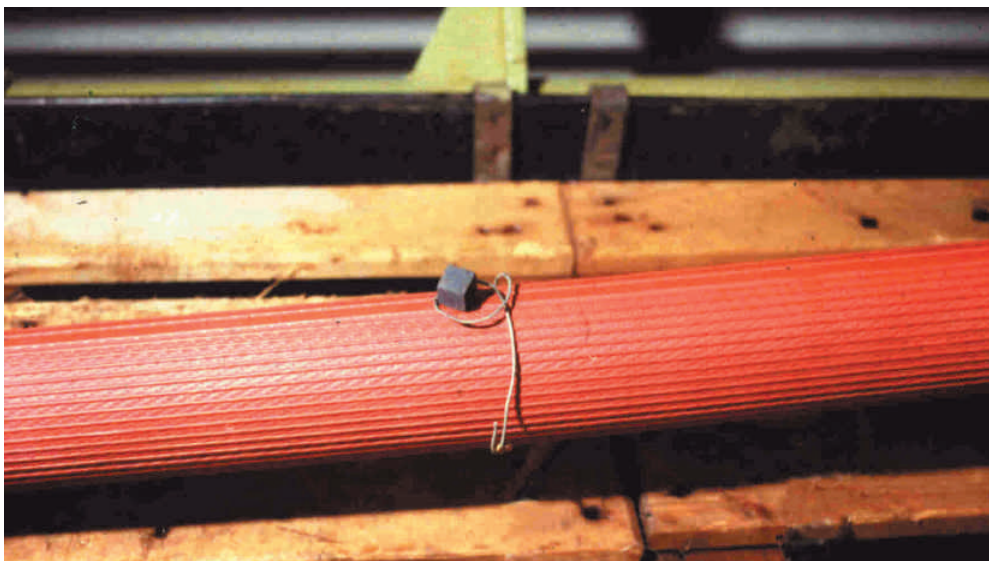
Angus Fire

Fire fighters place huge demands on layflat delivery fire hose. This is not only in actual use with pumps and vehicles, but also in storage, transport and handling. Perhaps the most important of these demands is that water pressure is not lost during an emergency as a result of kinking, leakage or damage. Alongside these considerations, purchasing officers need fire hose that will give a high return on the initial investment by providing a long operating life with minimal maintenance. It should have independent third party certification of compliance with any standards or approvals claimed by the manufacturer, and of course cost must be as low and competitive as possible.

Before selecting a fire hose, a purchasing officer needs to understand the terminology that is frequently used to describe the main types of hose. This originates from the British Standards Institution (BSI) BS 6391 Specification for non-percolating layflat delivery hoses and hose

assemblies for fire fighting purposes. Primarily concerned with the performance characteristics of fire hose, it is the industry standard worldwide. The BSI Kitemark provides an independent endorsement that a layflat delivery fire hose has reached the BS 6391 Specification.

The Kitemark licence scheme for fire hoses requires manufacturers to submit their product to rigorous examination and testing to BS 6391 by an independent authority, and also to operate a quality management system accredited to BS EN ISO 9000 to ensure consistency of quality. Samples of product are randomly selected by BSI from a manufacturer's current production or from the open market and tested to confirm full compliance with BS 6391. To maintain its Kitemark licence a manufacturer is monitored through regular audits of its product and quality management system. It is this combination of product and system assessment which makes the Kitemark so highly regarded worldwide.



Displayed on the product, the Kitemark gives fire hose buyers visible evidence of the product's quality, safety and performance as defined in BS 6391. It also shows that the product is independently and regularly tested by BSI to the approved specification. Any manufacturer can claim compliance to a British Standard, but for a fire hose buyer to be confident of compliance there is no better assurance than insisting on the Kitemark in Requests for Quotations and obtaining the licence number for further verification on the BSI web site www.bsi-global.com.

Hose categories

In BS 6391 fire hoses are classified into three categories. Type 1 and Type 2 hoses comprise a circular woven jacket or reinforcement made from a synthetic fibre with an impermeable internal elastomeric lining. Type 1 hoses are those "to which no external treatment has been applied to the reinforcement and are therefore liable to absorb liquids and need to be thoroughly dried after use". These types of fire hoses are sometimes called "conventional hoses". Type 2 hoses are those "to which an external elastomeric coating has been applied to the reinforcement to give some protection against the absorption of liquids and to improve resistance to abrasion of the reinforcement".

The more advanced low maintenance Type 3 hoses are those "to which an external elastomeric coating or covering has been applied to, or been incorporated in, the reinforcement to give the hoses very low absorption of liquids and high resistance to abrasion and heat." These notably include some "covered" fire hoses such as Angus Duraline that are manufactured by extruding rubber "through the weave" to form an internal lining and external cover chemically bonded to a circular woven synthetic jacket sandwiched in the middle.

Type 2 or 3?

Different hose constructions and production techniques used by manufacturers sometimes give rise to confusion as to whether a fire hose is Type 2 or Type 3. This is easily resolved by BS 6391 tests that

assist in differentiating between the two types of hose.

For example, the abrasion resistance test measures the ability of a fire hose to resist damage from general wear and tear, in particular dragging over rough surfaces like concrete and tarmac. The test involves an abrasive material being rubbed against a charged hose and the number of cycles completed before the hose bursts being recorded. For 64 mm diameter fire hose, for example, the minimum number of cycles before bursting must be 65 for Type 2 hoses and 90 for Type 3 hoses. Many fire hoses that are claimed by their manufacturers to be Type 3 hoses in fact fail after only about 50 cycles. In contrast, top quality Type 3 hoses with covers made of good quality rubber can withstand over 150 cycles, significantly above the minimum requirement.

BS 6391 also requires Type 3 hoses to pass a heat resistance test. This involves a metal cube at a temperature of 600°C being placed on a charged hose and the time to burst being recorded. None of the test pieces that are claimed to meet BS 6391 Type 3 should burst within 15 seconds of the application of the hot cube. Type 2 hoses often fail in less than 10 seconds due to the low melting point of their yarns. In contrast, the best Type 3 hoses will continue to hold pressure for over 40 seconds or not burst at all.

Fire hoses that are claimed to be Type 3 must also pass the oil resistance test. Hose samples are immersed in hot oil for three days and then subjected to an adhesion test in which the rates of separation of the lining and cover from the reinforcement must not exceed 25 mm/min.

Certification

Nowadays it is common for fire hose manufacturers to claim that their products are "manufactured to British Standards", "conform to BS" or are "tested to BS". All these claims fall short of the most important claim, namely that a fire hose is Kitemarked. Some manufacturers may claim to have independent third party certification proving that their product complies with BS 6391 and, by inference, suggest that their products are Kitemarked. Such a certificate may in fact

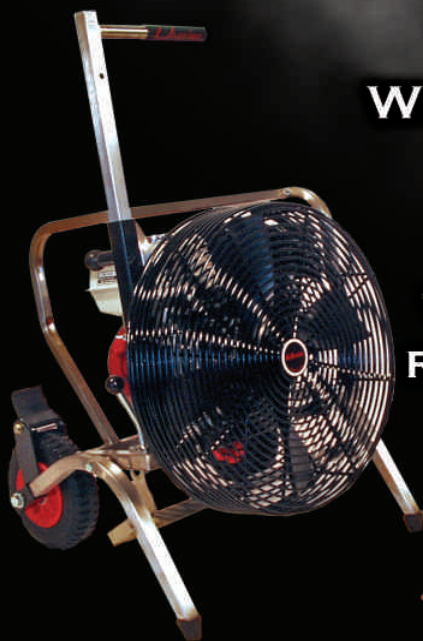
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demonstrate little more than the fact that a manufacturer has produced a single length of hose in advance to meet BS 6391 requirements rather than BSI selecting randomly and independently from standard production hoses. To hold a Kitemark requires continuous assessment by BSI rather than a one-off test on a single hose sample. The only proof that a fire hose is Kitemarked is a BSI Kitemark licence.

Comprehensive testing

What sets BS 6391 apart from other specifications is its comprehensive testing regime. Hose samples are submitted for type testing to confirm full compliance with the construction, dimensional,

weight, burst pressure, adhesion, moisture absorption, flexibility, heat ageing, abrasion resistance and ozone resistance requirements described in the Specification.

To achieve and maintain the Kitemark, a manufacturer must pressure test every length of hose and hose assembly that it produces at 22.5 bar for one minute to make sure there are no signs of leakage or any other defects. It is this 100% testing that reassures the hose buyer that BS 6391 Kitemarked product will have properly tested and consistent performance.

Even the way the fire hose is marked is specified by BS 6391. Each length of hose shall be clearly and indelibly marked with the manufacturer's name; BS 6391:1983 and the type number of the hose; the nominal bore in millimetres; the month and year of manufacture; and importantly the Kitemark logo. So when specifying a BS 6391 Type 3 hose, check that the manufacturer is marking it correctly. If not, then it is failing to meet even the most basic of the Kitemark requirements.

Kink resistance

Specifying fire hose correctly is becoming so important that some buyers are even going beyond specifying the Kitemark. This is because layflat fire hoses have a tendency to fold or "kink" when used at low pressures. This is extremely common in operational use, the classic example being a hose dragged through a narrow opening such as a ship's doorway.

Kink resistance is a critical feature of fire hoses.

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When a hose kinks, two things happen. Firstly, the flow through the hose is throttled and therefore reduced. Secondly, at the point of kinking a high spot is formed that leads to excessive abrasion and early failure of the hose. Both these effects mean reduced hose efficiency or even complete loss of flow.

Hose kinking is so damaging to hose longevity that some buyers demand assurance against it by specifying a kink test such as the UK Navy Kink Test in addition to BS 6391. Such a test shows that some hoses will not kink at low pressures and so maintain their profiles because synthetic yarn used by some manufacturers has good extension properties. The best fire hoses are capable of bending around a 45 gallon drum at pressures between 3 and 5 bar without kinking.

Kitemark licence proves compliance

When specifying a fire hose, performance should be of paramount importance. It is the only way to gain the peace of mind that you have done everything possible to prevent a hose failure from suddenly cutting off the vital supply of water to a fire fighter. For over twenty years the BSI Kitemark scheme has been providing fire hoses with global credibility. This heritage and unrivalled expertise ensures that BSI is one of the preferred product testing and certification bodies for anyone seeking third party verification or certification. The BS 6391 standard is the pre-eminent standard in testing the key performance characteristics of layflat fire hose, and BSI's impartial investigation into the performance of fire hoses is invaluable in helping buyers to make the right choice.

Conclusion

When specifying a layflat fire hose Type 1 and 2 are suitable for use in low and medium risk applications, but for high risk applications such as those handled by local authority and industrial fire services only Type 3 are considered to have the right performance. Whatever else you do insist on a BS 6391 Type 3 Kitemark in your fire hose purchasing specification, and make sure you see the licence! There is simply no better recommendation of quality, safety and reliability than the Kitemark. **IFF**

Clair Maxwell is Product Manager at Angus Fire responsible for the global marketing of the company's wide range of fire hose products including Duraline. Angus Fire is part of UTC Fire & Security, which provides fire safety and security solutions to more than one million customers around the world and is headquartered in Connecticut, USA.

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Escape Chute Floor Mount. Picture courtesy of Escape Chute Systems



Chutes and Emergency Egress

By Robert J. Wheeler, P.E.

Hughes Associates, Inc.

Escape chutes are typically used on large mining equipment and machinery, passenger cruise ships, silos, air traffic control towers, offshore oil platforms and commercial aircraft (escape slides). The concept of escape chutes was developed more than 100 years ago and since about the early 1980s they have been used as alternative means of egress from multi-story buildings. Escape chutes are commonly used in Europe on tall structures and older heritage buildings where externally mounting fire escape stairs is not possible.

Although the idea of using a chute is not appealing to some, they are growing in popularity. Their use as an alternative means of egress has become even more of an issue after the World Trade Center disaster in which the primary means of escape were rendered unusable. Many questions and concerns have been raised regarding the safe and effective application of escape chutes to multistory buildings. This article summarizes the current uses, limitations and capabilities of escape chutes as emergency egress devices.

Design and Application

Although specific design and operational features of escape chutes vary among manufacturers, they basically consist of (1) the escape chute (generally an inner, middle and outer layer), (2) a storage

deployment device and (3) a means to mount them to the building. There is no limit on the height of a chute per se. One of the highest emergency escape chutes is 173 m (568 ft) and according to one manufacturer a 650 m (2,130 ft) chute is currently on the drawing board. Typical installations are for buildings up to approximately 30-stories. To use a chute one sits on the edge of the opening and lowers themselves inside, as shown in the following pictures.

The inner lining of the chute "grips" the person and gravity does the rest. Arms and legs are extended outward to lower the speed of descent and brought in towards the body to increase the descent.

According to one manufacturer the throughput of a chute is around 30 persons per minute and multiple persons can be in the chute simultaneously.

Rooftop Single Entry in use. Pictures courtesy of Escape Chute Systems



The manufacturer also estimates that the chute container could be opened in 15 seconds and the time to traverse the chute for a 10-story building is

approximately 40 seconds. The number of persons in a chute simultaneously is a function of the structural integrity of the chute, storage deployment device and the connection to the building. It is recommended that the first person through the chute be a fully trained member of the staff and that another trained member remain at the chute entrance to guide users and control the number of persons entering the chute. When not in use escape chutes are stored in a storage deployment device.

Both single-entry and multiple-entry chutes are in use. A single-entry chute is installed at windows, corridors, balconies or rooftops and is typically used on older buildings where the multiple-entry chute cannot be used. Chutes typically range from 2-stories up to about 200 m (656 ft) and must have a clear and uninterrupted fall to ground level. Multiple-entry chutes are installed inside protected vertical shafts in the building with one chute segment per floor level. Entries into the chute are available from each floor level.

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Issues and Concerns

Human Factors

There have been many questions and concerns regarding escape chutes. The primary issue is psychological. How willing (or reluctant) will a person be to use an escape chute from a great height? Factors such as claustrophobia and acrophobia are prime concerns. Most people are familiar with emergency escape slides from aircraft, but would they use them? Most likely, yes. How about an escape chute from a passenger cruise ship? Again, the answer is most likely yes. However, in both of these situations there are few, if any, other alternatives to quickly and safely evacuate the spaces. Also in these situations personnel that are trained in emergency evacuations and the use of these devices are available to provide assistance and direction.

Increased attention is focused on the evacuation of Very Large Transport Aircraft (VLTAs); specifically, how willing will a passenger be to jump onto an escape slide from the upper deck of an aircraft that may be as high as 11.5 m (38 ft) above the ground. Conclusions of one study have shown an increased exit hesitation time of passengers. Although the study did not directly address the use of emergency chutes from tall buildings the psychological effects are similar. Imagine a person on the 10th floor of a building being asked to step into an escape chute. Also, evacuees are not able to see out of an escape chute. While this

may help in alleviating the visual effect of height, will it contribute to a sense of claustrophobia, resulting in a fear of using the chutes under emergency conditions? Studies of human behavior relative to using these devices are needed prior to widespread installation.

Ergonomics

What is the target population for whom escape chutes are designed? A design to accommodate all ranges of possible sizes and physical capabilities of potential evacuees may be impossible. One manufacturer reported that the youngest user would be about 6 or 7 years old. The entrance to one chute is approximately 600 mm (2 ft) in diameter and has been successfully used by men weighing approximately 150 kg (330 lb). However, an individual of this size has been shown to slow down the throughput of the chute. At a certain point a person's size can preclude their use of a chute, or lead to a blockage or failure as subsequent evacuees pile up. There is a danger of skin burns on knees, elbows and heads; the longer the chute the greater the burn. In turn, this may result in evacuees that are slow to move away from the base of the chute upon reaching the ground level so that other evacuees can exit.

Regulations

Escape chutes are not required by any of today's building or fire codes, making their use voluntary and at the discretion of building owners. Consequently, building owners, manufacturers and Authorities Having Jurisdiction are making decisions on the design, installation and approval of systems without a set of standards or requirements. In spite of growing interest, should this information be included in codes prior to any standards being developed that govern them? Standards development may be necessary if for no other reason than to provide a consistent, uniform set of criteria.

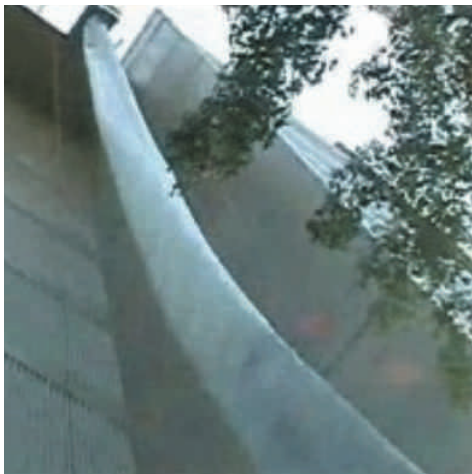
Escape chutes are not required by any of today's building or fire codes, making their use voluntary and at the discretion of building owners.

The American Society of Testing and Materials (ASTM), Subcommittee E06.77, High Rise External Evacuation Devices is developing standards for three types of devices:

- Platform Rescue Systems (PRS),
- Controlled Descent Devices (CDD), and
- Chutes Devices (CD)

Standards are required that address such issues as reliability; operation in adverse weather conditions; structural loading; communications during evacuation; size, age and physical limitations of evacuees; and quality of materials.

The National Fire Protection Association has also considered recognizing these types of systems. The NFPA Technical Committee on Means of Egress developed potential code language defining and recognizing escape devices and systems as supplemental evacuation devices in NFPA 101, *Life Safety Code*, and NFPA 5000, *Building Construction and Safety Code*. Language addressing escape



Rooftop Single Entry chute deployed. Picture courtesy of Escape Chute Systems

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Rooftop Moveable Platform – GPO Building. Picture courtesy of Escape Mobiltex (S) Pte Ltd



devices made its way through the NFPA committee after much debate and was sent to a vote at the full members meeting in 2005. At this meeting the issue was voted down and is therefore not included in the current code revisions.

Training

Who should be trained, to what level and how often should training be held? One manufacturer provides a 4-day training course for new installations. This enables the training of eight (8) future trainers and 250-300 end users. However, with potentially large occupant turnovers and daily visitors to buildings more frequent training may be warranted for building owners, occupants, and fire department personnel. Should training also be

extended to include visitors to buildings with escape chutes and to what extent?

Maintenance and Inspection

The extent to which escape chutes should be inspected and maintained must be considered. Experience with other fire protection and life safety systems indicates that inspection and maintenance of installed systems is one area that is often overlooked. One manufacturer recommends an annual inspection by a local agent and an inspection by the manufacturer every 5 years.

Deployment

In emergency situations occupants of a building, when given a choice, tend to utilize the same route to exit a building as they do to enter the building. For multistory buildings this generally will be the stairs located at the core of the building. How effectively can occupants be redirected to locations of escape chutes?

In addition, a decision must be made whether to deploy single-entry escape chutes immediately to supplement existing means of egress or as a last resort when other means of egress become compromised. Deployment of a single-entry escape chute as a supplementary means of escape some time after the start of a building evacuation may require occupants to reverse their direction of travel in order to use the chute. This poses obvious

**In emergency situations
occupants of a building, when
given a choice, tend to utilize
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as they do to enter the building.**

logistical problems relative to crowd movement. Single-entry escape chutes extending to ground level require a run-out distance at ground level to allow evacuees using the chute to slow before exiting. The run-out distance may be affected by emergency response apparatus.

Another problem during use of evacuation chutes will be communications between the entrance point and termination of the chute, whether at ground level or another level of the building. Effective communication will be necessary to properly monitor the flow of personnel through the device.

Conclusion

Escape chutes have been shown to be effective and accepted as emergency egress devices in certain applications including buildings. However, as their application in multistory buildings, and especially high-rise buildings increases, the study of human factors relative to their use should be considered.


Although the use of an escape chute is as an alternative and supplemental means of egress, a uniform set of standards and criteria is needed by which these devices are manufactured, tested and approved. Inclusion of escape chutes in building codes and standards will also provide uniform guidance on the selection, design and installation, training and maintenance of these devices. **IFF**

Rooftop Single Entry – Roof Entrance. Picture courtesy of Escape Chute Systems



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How Singapore Changi Airport's Airport Emergency Service prepares itself for the New Large Aircraft, the Airbus Industrie's A380

By Joseph Fernandez
and En-Huang Tay

Singapore Changi Airport's Airport Emergency Service (AES) has been providing the local airport community with fire-fighting and life rescue services since its formation back in the old Paya Lebar Airport. Over the years, the AES has been modernising itself in tandem with Singapore's vibrant and competitive aviation industry. Where annual reviews conducted with the airport's senior management justify the need for 'heavy' investment in its emergency response capability, the AES has often been fortunate enough to receive the necessary funding to acquire the needed resources.

As most fire and emergency response professionals are aware, funding is not very often available to Airport Rescue and Fire-Fighting units (ARFF) all over the world. However, any ARFF unit that lacks the necessary funding can justify its operational capability and professionalism in its 'software'. These are its emergency responders, as well as its ability to swiftly execute operational plans and training needs. No doubt the AES receives sufficient funding when needed, it also ensures that its software

is not neglected. Thus, scenario-based as well as equipment drills are regularly conducted at the operational level while the management ensures that the AES' response plans and procedures are in accordance and relevant with the dynamic aviation environment. And together, the AES works jointly with other related agencies, such as the armed forces, civil defence, police, as well as other relevant ministries in its annual aircraft response exercises. In short, a collaborative effort will determine the overall success in Singapore Changi



Airport's capability to handle aviation-related incidents. Throughout this article, readers will see constant resemblance to this 'success formula'.

AES' approach to the A380

With the dawn of the new millennium, while the aviation industry has had to grapple with the reverberating effects of terrorism, Singapore Changi Airport was also preparing itself for the arrival of the Airbus A380. Apart from upgrading its hardware ranging from the widening of its taxiways and modifications to Changi's aerobridges, the airport has also undergone a series of reviews on its present processes ranging from apron operations, engineering facilitations, as well as the recruitment of suitable talent to cater not only for the arrival of the A380, but also for the growth of Singapore Changi Airport. The AES is one of the divisions that has taken part in this preparation and upgrading as well.

Starting with the annual review of the AES' available resources, fleet projections were made to determine the needed appliances way back in 2001. Taking into account the specifications of the A380 from Airbus Industrie, the AES worked together with the other divisions within the Civil Aviation Authority of Singapore (CAAS) to ensure that future appliances acquired and manpower recruited would fall within the overall framework in preparing for the A380. For the AES specifically, the areas of training needs, operational plans and procedures, logistical acquisition were some of the issues taken into account in its preparation activities.

a Enhancement of Fire Protection Coverage

The Airbus A380 aircraft is classified as a Category 10 aircraft under the ICAO's guidelines. This directly translates to the amount of

extinguishing media (ie, comprising of foam as the primary agent and dry chemical powder as the secondary agent) that needs to be carried on board the airport's fire fighting appliances, as well as the overall discharge rate capability. Since 2005, The AES has migrated from Fluoroprotein (FP) foam, a level A foam, to Film Forming Fluoroprotein (FFFP) foam, a level B foam. Thus, the amount of water carrying capacity for fire vehicles (for category 10 coverage) carrying Level B foam would be 32,300 litres and must be able to discharge 11,200 litres of foam per minute.

b The A380 Emergency Preparedness Seminar

To foster greater understanding amongst the various emergency response organizations as well as foreign ARFF units and develop a better understanding on the uniqueness of the A380, the AES had successfully organized the above seminar on 16 February 2006 at the Singapore Aviation Academy. This event was attended by over 100 participants from over 9 countries.

Amongst the topics presented was, "A380 Airport Rescue and Fire-Fighting" presented by Dr Thilo Stilp from Airbus Industrie, which generally covered the unique fire-fighting characteristics of the A380, as well as a first-hand sharing experience by Captain S L Leong of Singapore Airlines, who operated on the A380. The topic on aircraft recovery, especially for the A380 was also covered by Mr Darren Straker from Airbus Industrie.

Apart from speakers in the aviation engineering industry, the airlines as well as suppliers, the AES also fielded 2 topics, covering the proposed enhancement of the mutual aid plan taking into account the A380, as well as a presentation of the AES' unit tactical plan for A380 incidents.

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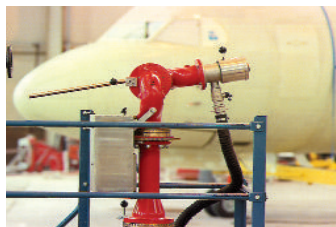
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c Acquisition of Fire Vehicles and Sea Rescue Vessels

The AES adopts a strategic approach in vehicle purchasing. Commencing from discussion with visiting foreign ARFF visitors, expert suppliers as well as interaction during seminars and conferences, officers from AES continuously maintain a 'look out' for changing needs in the aviation industry with regards to ARFF operations. The pre-decision to purchase a vehicle can be made

as early as 5 years in advance, but still subject to change depending on the aviation environment. Especially so, if you take into account the common concern of aviation terrorism and of course, the A380.

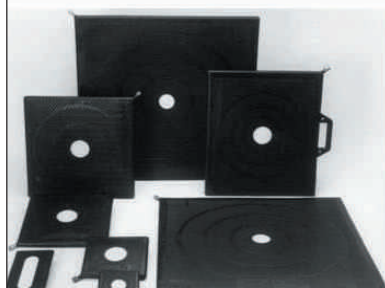
In previous years, the AES would tend to look out for 'conventional' fire vehicles to replace its older fleet of vehicles. However, as the A380 requires a category 10 fire protection coverage, the common misconception would be to purchase more fire vehicles so that this coverage can be met. But with the restriction of storage facility and engine

bays for these additional vehicles, purchasing additional vehicles to make up for the coverage was out of the question. Hence, a decision was made to replace some of its ageing vehicles with the ultra large foam tenders, each with a water carrying capacity of 12,000 litres, as well as taking advantage of the upgrading of foam to Level B. Thus in mid 2006, the AES received four 8 x 8 ultra large foam tenders from Chinetti, Italy. The AES has named them 'Tigers'.

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As Changi Airport has 2 runways with a fire station to each runway, these 2 fire stations will each house two Tiger foam tenders. With the addition of these foam tenders, Changi Airport is now able to provide more than the minimum requirement for category 10 coverage for each runway, taking into account its existing fleet of foam tenders as well.

One of the challenges that the airport fire service will face in mitigating aircraft emergencies involving the Airbus A380, will be the quick access for fire fighters to enter the upper deck of the aircraft to carry out internal fire fighting operations as recommended by the ICAO. ICAO also recommends the use of special equipment for accessing the upper deck to facilitate emergency evacuation of injured or handicapped persons. Because of the height of the aircraft's upper deck passenger cabin, it is difficult and unsafe to use conventional fire ladders for rescuers to gain access to the passenger cabin and evacuate injured passengers. As such, the AES has recently acquired two Rosenbauer Emergency Airstairs (one for each runway) to assist in passenger evacuation as well as to facilitate our fire-fighters to gain access into the aircraft for internal fire-fighting if need be. These 2 vehicles have the capability to extend its stairways up to a maximum height of 8.48m, and come with a water tank capacity of 1,000 litres for hosereel operation at the stair deck.

As the AES has taken the step to only increase the extinguishing media capacity of its foam tenders (as compared to increasing the number of vehicles), this has provided the division with manpower savings and at the same time, having the capability to conduct fire-fighting and rescue operations on a new large aircraft. The only increase in manpower staffing would be for the Emergency Airstairs with only one operator each.

Besides the 2 types of vehicles purchased specifically for the A380, the AES will continuously be upgrading its fire-fighting fleet to enhance its operational capability in the future.

In near future, AES will replace its 12-year old rescue hovercraft. The new hovercraft will have the seating capacity of 50 passengers.



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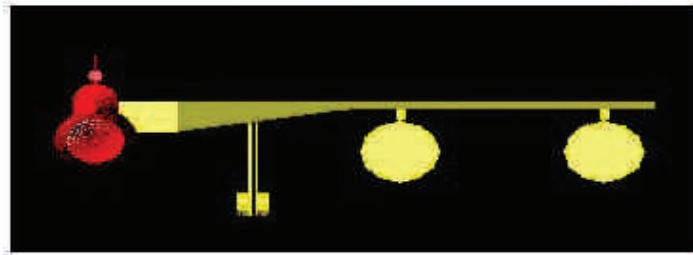
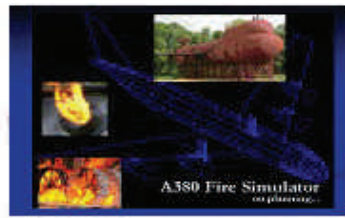
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d Training Needs Enhancement

To ensure all AES staff are aware of the general specifications as well as the fire-fighting tactics to be deployed for an A380 incident, 2 approaches are generally adopted: the software and, the hardware approach.

The AES currently makes use of the Aircraft

Virtual Interior Training Simulator (AVIS) to familiarise its staff on the various layouts and characteristics of current commercial aircraft as well as fighter-jets. A recent upgrade was made to this program to incorporate the features of the A380. In addition, while adopting the IT approach, operational staff are required to pass

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the annual rating tests on the A380.

Apart from carrying out theoretical training, the AES also regularly carries out live hot fire drills at its life-size aircraft mock-up. To add to the realistic training for the A380, upgrading works are currently underway to add an additional deck on the existing mock-up to simulate the upper deck of the A380. This not only allows the operational staff to practise their fire-fighting skills on the mock-up, but also allows the fire appliances to practise its tactical deployment and foam discharge skills as well. Not to mention, the newly acquired Emergency Airstairs can also be practised on the mock-up once modifications are complete. As before, rating tests will also be conducted, and all operational staff are required to pass them.

e Joint Training with Mutual Aid Organisation and Stakeholders

As mentioned earlier, a successful aircraft emergency operation can only happen through good collaborative efforts amongst the various divisions of the CAAS as well as its mutual aid partners.

The AES will continuously review and update its operation plans and procedures as well as its

Airport Emergency Plan (AEP)

Apart from its annual aircraft crash on land and sea exercises, the AES will be conducting a joint agency table-top exercise in preparation for the A380 in late October 2006. This will see once again the participation of our mutual aid partners from the local police, the armed forces, civil defence, health organizations, as well as other ministries. Through such exercises, the AES will continuously review and update its operation plans and procedures as well as its Airport Emergency Plan (AEP), which will see its dissemination to all mutual aid groups to enhance emergency operations co-ordination not only for the A380, but also for all aviation related incidents.

Conclusion

The A380 poses a whole new set of challenges not only for the AES and the CAAS, but also to all members of mutual aid organizations. Whilst the availability of financing can certainly do a lot in terms of materials, manpower and training needs acquisition, much also depends on the effort of the people within the organisation. Having a clear understanding and adopting the right attitude in operational matters in response to this new large aircraft will certainly fill up the remaining gap, which is much needed in conducting a successful aircraft emergency operation.

While the A380 has yet to be delivered to Singapore, the AES will continuously be seeking out better and more efficient ways and means to ensure its operational readiness can be greatly enhanced to further meet the challenges of the A380. Where lives are concerned, no one can afford to underestimate the element of risks involved nor be complacent with the amount of training involved in order to be better prepared. **IFF**



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Airport Firefighting – A Day in the Life

By Richard Storey

For Bristol Uniforms Ltd

For the thousands of firefighters covering over 80 major commercial airports throughout Europe life is very different from that experienced by their municipal fire and rescue service colleagues. The differences begin with the type of regime they experience to the types of emergency they are called upon to deal with on a daily basis.

Airports with scheduled passenger services range from the largest international airports such as Heathrow, Gatwick, Paris, Amsterdam Schiphol and Frankfurt to some of the smallest which include those serving smaller communities in Scandinavia and the Highlands & Islands Airports group in Scotland with 10 locations spread across some of the most inaccessible parts of the country. BAA (formerly The British Airports Authority) is the largest airport operator in the UK with 7 locations and employing over 450 firefighters at their sites at Heathrow, Gatwick, Stansted, Southampton, Glasgow, Edinburgh and Aberdeen. One of the largest international airports in the European Union is Amsterdam Schiphol which ranked fourth in Europe in the number of passengers handled (over 44 million in 2005) after Heathrow, Paris Charles de Gaulle and Frankfurt. Schiphol has recently been voted third best world airport for leisure facilities in the Skytrax 2006 World Airport Awards.

A typical day on shift

Unlike their municipal counterparts, airport firefighters are required to cover all types of emergencies within the airport boundaries with many of the incidents unrelated to aircraft accidents or fires. Major aircraft accidents are very rare thanks to strict safety regulations and major improvements in aircraft design and build.

In many locations the fire services work closely with the ambulance and other emergency services dealing with all types of accidents including traffic incidents, vehicle fires, and fire alarms across the sites as well as being placed on standby whenever a pilot alerts traffic control to any type of malfunction which could present a safety hazard on landing.

The most frequent incidents affecting jet aircraft involve overheating of undercarriages, wheels, tyres and brakes as well as engine problems, which although uncommon, nevertheless require putting into action major emergency standby routines.



Station Officer at Bristol International Airport, Rich Lynn, who has 48 firefighters on station explained that his team are required to cover all emergencies on site including those involving buildings, vehicles and aircraft related incidents. "We provide emergency cover for all 11 buildings on the airport site as well as dealing with aircraft related emergencies. Although we have very few aircraft fires the main potential areas for fire are

overheating sub-assemblies, wheels and brakes and any ruptures in hydraulic lines which work at high pressure and could easily cause a fire in contact with hot metal. Carbon fibre braking systems and fans on wheels on modern aircraft have greatly reduced the fire hazard".

Chief Fire Officer at Schiphol Airport, Michel Wendel, explained that his firefighters are called upon to deal not only with aviation related

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incidents but many others in and around the Schiphol area which are more closely related to normal fire duty callouts. On average there are in the region of 50 aviation related incidents annually with several hundred other callouts for various fire and other related hazards during the year around the large Schiphol site. Although the airport only has one terminal building this is split into three large departure halls which serve the 6 runways which range in length from over 2km to 3.8km. The most recent runway to be built was completed in 2003 and there are already plans to add a seventh in the near future. Schiphol is the world's lowest major airport being 3 metres below sea level.

Carbon fibre braking systems and fans on wheels on modern aircraft have greatly reduced the fire hazard.


Schiphol has a good air traffic accident record. The last major fire was in October 2005 and was non-aviation related. A fire broke out at the airport's detention center, killing 11 people and injuring 15. The complex was holding 350 people at the time of the incident. The last aviation accident occurred over 12 years ago when a Saab 340 operated by KLM Cityhopper, returned to Schiphol because the crew mistakenly believed that the engine suffered from low oil pressure because of a faulty warning light. On final approach, at a height of 90 feet, the plane stalled and hit the ground. Of the twenty-four people on board, three were killed including the captain. Nine others were seriously injured.

Training

Even though the call to action to fight fires may come infrequently, the special characteristics of hot fires caused by burning aviation fuel need special skills. Training is a regular and frequent part of the firefighters working life.



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At Schiphol training is carried out on a daily basis. There are 125 full time firefighters on station who all work shifts of 3 teams over 24 hours. The size of the airport complex is such that the firefighters operate out of 3 fire stations, Rijk, Sloten and Vijfhuizen which are located around the site. Michel Wendel gave details saying, "Fire training is carried out at the main station, Sloten, on a daily basis. Firefighters are on rotational duty at Sloten and their training is undertaken when they are on main station duty. Normally training sessions last about 4 hours. A range of training is carried out including simulated fire fighting on a Boeing 747 test rig with a computer controlled gas fire".

**Even though the call to action
to fight fires may come
infrequently, the special
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fuel need special skills.**

Gerard Montgomery, Senior Airport Fire Officer at Gatwick, has 80 firefighters on location including himself and a deputy. His team is responsible for dealing with all site emergencies and shares daytime callouts with the ambulance service. With responding to all fire alarms and traffic accidents at Gatwick his crew handle around 2,500 callouts annually. On training Gerard explained, "We carry out training on a weekly basis on an LPG Boeing 747 aircraft simulator. This would involve a number of fire scenarios and also provides training for breathing apparatus, hose management and ladder work. We are also acquiring a fire behaviour simulator which will provide carbonaceous fire scenarios. The new unit was installed in the summer of 2006".

Firefighter clothing

Most, if not all, airports use a selection procedure for purchasing firefighter PPE which routinely involves trialling samples of kit from several manufacturers. The alternatives are inspected and supplied to firefighters to carry out wearer trials. Selection is based on a number of criteria including wearer comfort, durability, price, sizing and availability of stock.

A number of airport fire teams are being, or have been, re-equipped over the past 2-3 years giving them the opportunity to take advantage of the new lightweight designs being introduced to the market which provide greater wearer comfort and reduce heat stress associated with prolonged periods of wear. There is also growing interest in adopting managed care services as a means of providing regular inspection, washing and repair.

Phil Tasker, Bristol Uniforms' UK Sales Manager, who is responsible for the company's supply contracts with UK airports has witnessed considerable change in the specification and purchasing of PPE in recent years. He commented, "The operational demands placed on airport firefighters around the UK may vary considerably from site to site but 30 airports, including 7 BAA airports and Bristol International have one thing in common – they all rely on Bristol Uniforms' PPE to protect their firefighters. We have seen a steady move to replace traditional PPE designs with our Ergotech™ lightweight jackets and trousers introduced to the market in 20032.

Melvyn Owen, one of Bristol's Regional Export Sales Managers, whose responsibilities include the Netherlands commented, "We work closely with our distributor, Mekkey, based in Hengelo who have been very active in developing relationships with major users of firefighter PPE in the country including Schiphol. Mekkey's relationship with the firefighter team at Schiphol resulted in the adoption two years ago of our lightweight Ergotech™ style PPE which is proving very popular with the firefighters on station at the airport".

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The protective fire safety on airports is generally considered to be one of the most complex and greatest challenges for the fire services – and thus also for all manufacturers of fire fighting vehicles. IVECO MAGIRUS offers a world-wide unique product range for holistically covering all potential hazards that must be met on airports.

With the airport crash tender range DRAGON x4, x6 and x8, IVECO MAGIRUS offers three variants in this “top of the range” category, that will meet even the most specific requirements. The IMPACT series, with the variants x4 and x6, is the ideal completion to the DRAGON range or even a cost-effective alternative, e.g. for smaller airports.

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The protective fire safety on airports is generally considered to be one of the most complex and greatest challenges for the fire services – and thus also for all manufacturers of fire fighting vehicles. IVECO MAGIRUS offers a world-wide unique product range for holistically covering all potential hazards that must be met on airports.

For the protection of buildings and facilities, IVECO MAGIRUS offers a wide range from command vehicles via first-intervention vehicles, light and special fire fighting vehicles to various different turntable ladders and aerial telescopic platforms with a rescue height of up to 54 m. Rescue vehicles and equipment carriers as well as swap body vehicles with a large roll-off container program complete the range.

With the airport crash tender range DRAGON x4, x6 and x8, IVECO MAGIRUS offers three variants in this “top of the range” category, that will meet even the most specific requirements. Real powerhouses in the form of currently unrivalled high-performing IVECO 1,024 hp or 1,500 hp engines with last generation common-rail injection technology do not only provide for an enormous acceleration but also for an enormous fire fighting power. Up to 10,000 l/min pump capacity, 14,000 litres fire fighting agents in a combination of water, powder, and foam as well as precise monitors with long throw ranges guarantee a fast and effective fire fighting operation.

The excellent cross-country capabilities of these vehicles provide for an unrestricted mobility and ensure that fire fighting can also be effected away from the runway without any loss of time.

The IMPACT series, with the variants x4 and x6, is the ideal completion to the DRAGON range or even a cost-effective



alternative, e.g. for smaller airports. Based on highly cross-country capable, single tyre IVECO four-wheel-drive chassis, these vehicles are extremely mobile but nevertheless equipped with an impressive fire fighting power: depending on vehicle type up to 12,000 litres of fire fighting agent can be carried on board. This concept has been very much proven in practice as is shown by the more than 150 IMPACT vehicles that are currently in world-wide operational use at airport fire service departments.

Recently an IMPACT x6 (TLF 30/57-7-360) on an IVECO Trakker was delivered to the Adolph-Wuerth-Airport in Schwäbisch-Hall (Southern Germany). The vehicle features tanks for 5,700 l water and 750 l of foam compound as well as capacity for 360 kg of CO₂. The powerful MAGIRUS pump

delivers an output of 3,000 l/min at 10 bar. 440 HP engine power enables speed on the runway; all-wheel drive and single tyres allow it to be extremely capable off-road. Furthermore a lighting mast mounted on the rear of the vehicle with 2 x 1,000 W and a 13.5 kVA electric generator belongs to the vehicle equipment.

For the Schwaebisch Hall pump water tanker TLF as with all other IVECO MAGIRUS vehicles continuous operational preparedness is guaranteed: A network of Service stations in almost 150 countries around the globe is available round the clock.

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A vehicle for the 21st century

In mid-2005, ROSENBAUER presented the latest version of the PANTHER at the "INTER-SCHUTZ – DER ROTE HAHN" in Hanover. With this completely new advance in the PANTHER series, ROSENBAUER established fresh bench-marks in the design and engineering field and thus again underlined its role as the technological leader in the global ARFF vehicle market.

The aim of the new development of the PANTHER 8x8 and 6x6 series was to orientate the vehicle more closely to the increases in airport traffic. This means that the new vehicles are faster than their predecessors, can carry still more extinguishing agents and equipment due to higher axle weights, are easier to operate than ever before due to the electronic control concept and already meet the exhaust emission requirements expected in years to come. In addition, the latest PANTHER models have an innovative design language, which accentuates the vehicle's attributes of reliability, safety, power and dynamism.

A chassis in two versions

The 8x8 model comes with the new 1,000 hp MAN rear-engine chassis and automatic Allison gearbox, while the 6x6 model uses the 705 hp rear engine chassis manufactured by ROSENBAUER in the USA. With its eight powered wheels, operating weight of 40t, 14,500 l of extinguishing agents and a top speed of 135 kph, the PANTHER 8x8 is the ARFF vehicle for planes with the dimensions of an Airbus A380.



Panorama vision from the cabin

The cabin of the new PANTHER disposes over a panorama windscreen made of composite safety glass and for the first time, the vehicle also has transparent doors. As a result of the enormous front and side panes, which have been extended both up- and downwards, the driver has an optimum view of the area surrounding the vehicle.

High-performance, operational extinguishing technology

The PANTHER 8x8 has been fitted with the completely new RM60E roof monitor and the RM15E front monitor. Due to its high throughput capacity of up to 8,000 l/min at 10 bar and a throw distance of 95m, the RM60E roof monitor constitutes a significant vehicle innovation.

High international demand

Rosenbauer is also enjoying great success with the PANTHER, its top air-crash tender. Four units of this top model were ordered in June 2005 by Dubai International Airport. Shortly after Dubai, the Turkish Civil Aviation Authority freshly underlined the success of the new Panther, which ordered six Panthers for the airports in Istanbul, Ankara and Antalya. Contracts have also been received for example from the airports in Berlin, Newcastle and Belfast.

For further information please contact:

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Mass evacuation for aircraft

For many years now, Mr Joseph Fernandez, Chief of Changi Airport Emergency Services has been reiterating that the evacuation of passengers from aircraft under emergency conditions has been inadequate, bearing in mind that ladder stairs in normal use and apron equipment, and not readily available to the Emergency Services.

Furthermore statistics show that on average only 50% of slides actually function properly in Emergency situations, as could be seen in the Air France A340 incident at Toronto Airport.

His vision was to get fire fighters to reach the stranded passengers, and get them out quickly in an aircraft accident or in difficult scenarios such as high-jacking or bomb threats by having a stair unit, which can be activated with the other emergency vehicles, and will respond as fast as they do too.

But manufacturers saw little demand for such equipment due to the limited market appeal, as most airports shied away from the concept due to infrequent use, and the costs involved, and therefore stood by conventional methods.

However, with the advent of the A380, the needs became more pressing, in particular the evacuation of the upper deck, which in the basic design has 192 passengers



plus crew, but this could increase in configurations of a full economy section on the upper deck. Although the 747 has a similar height, concern was more limited, due to the amount of passengers located in the "bubble".

With much persuasion and commitment, Rosenbauer in conjunction with S K FIRE looked at the subject in more detail, and with the support of CAAS the first units are now in service at Changi Airport.

The resulting product is able to be deployed with the other emergency vehicles, and is capable of operating on a range of aircraft from 767 up to the A380 upper deck.

It is also built to comply with the requirements of European Machinery Directive 98/37/EEC, 98/37/EEC as well as EN 1915-2 (Aircraft ground support equipment – General requirements – Part 2 : Stability and strength requirements, calculation and test methods) and EN 12312-1 (Aircraft ground support equipment – Specific requirements – Part 1 : Passenger stairs), thereby making the stairs deployable on ramp operations where EEC standards are involved.

The stair can operate in winds in excess of 40 knots in accordance with EN 1915-2.

The design allows the deck to be adjusted from 3,200 mm to 8,350 mm, and with a platform width a the exit point of the aircraft of 3,000 mm, exiting into the 1,500mm wide stair sets is no problem.

The top deck can accommodate approx 26 people or 2,100 kg, and each stair tread is wide enough to support 3 passengers at a time approx 240 kg.

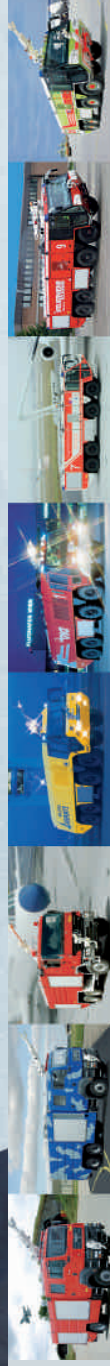
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Project:	MOD/8 units
Country:	Turkey
Chassis:	MAN TGA 33.480 6x6
Wheelbase:	4,500 mm
Engine performance:	353kW/480 HP
GVW:	33,000 kg
Dimensions:	9,800 x 2,500 x 3800 mm
Driver/Crew Cab:	1 + 4
Pump:	ZIEGLER FP 60/10-A
	Man pump engine perform.: 322KW/438 HP
Pump performance:	6,000 l/min at 10 bar
Roof – Monitor:	6,000 l/min at 10 bar
Bumper – Monitor:	1,600 l/min at 10 bar
Water tank:	10,000 l
Foam tank:	2,000 l

Other features:

- Monitor performance adjustable
- Lightmast
- Electronic automatic mixing unit
- Self protection system

FLF 80/125-10 Z8 Unique Zürich



Project:	5 units
Country:	Switzerland
Chassis:	MAN 36,1000 VFAEG 8x8
Wheelbase:	1,930+3,570+1.500 mm
Engine performance:	735 kW/1000 HP
GVW:	40,000 kg
Dimensions:	12,000 x 3,800 x 3,000 mm
Driver/Crew Cab:	1 + 2
Pump performance:	8,000 l/min at 10 bar
	Man pump engine perform.: 338 kW/460 HP
Roof monitor:	6,000 l/min at 10 bar
Bumper monitor:	2,200 l/min at 10 bar
	9 kg/sec Pulver
Water tank:	12,500 l
Foam tank:	1,000 l

Other features:

- According to ADV and ICAO recommendations
- ALPAS-superstructure with wide body cab
- Chassis and body for extreme offroad actions
- electronic foam proportioner EAD 80
- Equipment according to ADV and ICAO
- High pressure powder unit 500 kg
- CO₂ unit 270 kg

FLF 80/125-12,5 Z8 BWB



Project:	16 units
Country:	Germany
Chassis:	MAN 36.1000 VFAEG 8x8
Wheelbase:	1,930+3,570+1,500 mm
Engine performance:	735 kW/1000 HP
GVW:	40,000 kg
Dimensions:	12,000 x 3,800 x 3,000 mm
Driver/Crew Cab:	1 + 2
Pump performance:	8,000 l/min at 10 bar
	Man pump engine perform.: 338 kW/460 HP
Roof monitor:	6,000 l/min at 10 bar
Bumper monitor:	1.600 l/min at 10 bar
Water tank:	12,500 l
Foam tank:	1,250 l

Other features:

- According to ADV and ICAO recommendations
- ALPAS-superstructure with wide body cab
- Chassis and body for extreme offroad actions
- Electronic foam proportioner EAD 80
- Equipment according to ADV and ICAO
- Built in generator 17 kVA

FLF 80/125-16 Z8 Vienna



Project:	3 units
Country:	Austria
Chassis:	MAN 36,1000 VFAEG 8x8
Wheelbase:	1,930+3,570+1.500 mm
Engine performance:	735 kW/1000 HP
GVW:	40,000 kg
Dimensions:	12,000 x 3,000 x 3,800 mm
Driver/Crew Cab:	1 + 2
Pump performance:	8,000 l/min at 10 bar
	Man pump engine perform.: 338 kW/460 HP
Roof monitor:	4,500 l/min at 10 bar
Bumper monitor:	1,000 l/min at 10 bar
Water tank:	12,500 l
Foam tank:	1,600 l

Other features:

- According to ADV and ICAO recommendations
- ALPAS-superstructure with wide body cab
- Chassis and body for extreme offroad actions
- electronic foam proportioner EAD 80
- Equipment according to ADV and ICAO

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The Regulatory Reform (Fire Safety) Order

– Stronger powers for enforcers!

So what's new in the fire world?

Well most people would answer the re-organisation of the Fire and Rescue Services and whilst this is certainly high on the agenda, there have been other recent changes of which all those people connected with the fire safety of buildings should be aware. The major one for 2006 has been the Regulatory Reform (Fire Safety) Order (RRO) which became law in October. This has changed the way that the fire safety of buildings is managed and enforced.

By Graham Ellicott

Chief Executive,
Association for
Specialist Fire Protection
(ASFP)

Firstly though, a little background. To start with, what are the aims of the RRO? In the words of the explanatory notes to the order itself, *'The aim of the proposed reform is to reduce burdens on business that are caused by the existence of multiple, overlapping general fire safety regimes – and consequently overlap of the responsibilities of enforcing authorities. The proposed order would consolidate and rationalise much existing fire safety legislation (currently scattered across a large number of statutes and secondary legislation) into one order. In doing so it would reduce the number of enforcing authorities dealing with general fire safety matters. The reform would maintain and enhance the protection afforded to users of premises (and others who might be affected by a fire on the premises) by the existing legislation.'*

The proposed order would consolidate and rationalise much existing fire safety legislation.

In layman's terms, the RRO is intended to simplify fire legislation and in particular to remove the overlap between the Fire Precautions Act 1971 and the Fire Precautions (Workplace) Regulations 1997. The central aim of the Fire Precautions Act 1971 is to ensure that, in the event of a fire, the occupants can evacuate the premises safely, while the Fire Precautions (Workplace) Regulations 1997 requires employers to identify risks and take steps to remove or reduce them.

In particular the objectives of the RRO are to:

- Create a single regime, which can be better understood and administered by both businesses and the relevant authorities.

- To create a regime clearly based on risk assessment and fire prevention and mitigation measures.
- To increase compliance.
- To focus resources for fire prevention on those premises which present the greatest risk.
- To ensure that fire safety facilities and equipment (including fire alarms) are well maintained.

The removal of the Fire Certificate will undo the 'statutory bar' that holds back the upgrading of many older properties.

From the perspective of a building owner, the major transparent change under the new regime is the removal of Fire Certificates and the Department for Communities and Local Government (DCLG – formerly the Office of the Deputy Prime Minister) estimates that this alone will save business £1.65M per year. If you are responsible for a building you should be asking yourself what you should be doing now your fire certificate is defunct!! In other words, are you complying with the new regime? In addition, the removal of the Fire Certificate will undo the 'statutory bar' that holds back the upgrading of many older properties.

DCLG believes that the new regime will promote greater compliance and more focus on fire prevention in high-risk properties. For example, it is estimated that a reduction in the number of fires in England and Wales of 5%, 10% and 15% would achieve annual savings of £39m, £79m and £118m respectively, not to mention the unquantifiable saving in terms of the human costs of fire outlined above.

The RRO places the onus of the fire safety in buildings on the shoulders of the 'Responsible Person'. This person is:

- The employer (where there is one)
- The person in control of the premises in connection with the carrying on of a trade, business or other undertaking (for profit or not)
- The owner
- Any other person who to any extent exercises control over the place

Special consideration will also be given to any group of persons who may be especially at risk in case of fire, whether due to their location or any other factor.

Under the RRO, the responsible person will be required to ensure that an assessment of the risk of, and from, fire is undertaken for the place and activity. Identified hazards will be removed or reduced so far as is reasonable and special consideration will be given to the risks posed by the presence of dangerous chemicals or substances and the risks that these pose in case of fire. Special consideration will also be given to any group of persons who may be especially at risk in case of fire, whether due to their location or any other factor.

All precautions provided will be subject to maintenance and will be installed and maintained by a 'competent person'. Under the RRO, a person is to be regarded as competent where he/she has sufficient training and experience or knowledge and other qualities to enable him/her properly to assist in undertaking the preventive and protective measures. For commercial buildings the main enforcing body will be the local fire and rescue authority and the Fire & Rescue Services Act 2004 has enabled their enforcement. In the event of a dispute in England it will be settled by the Secretary of State, or in Wales by National Assembly.

For commercial buildings the main enforcing body will be the local fire and rescue authority and the Fire & Rescue Services Act 2004 has enabled their enforcement.

The 'Enforcing Fire Authority' will have stronger powers, including:

- New powers of entry and sampling
- New power to prosecute dodgy contractors
- New duties for fire prevention as well as fire intervention

The RRO is supported by a number of Guidance Documents that are building-type specific; thus providing help to the Responsible Person with regard to how risk assessments should be carried out for their particular type and size of building.

These Guidance Documents are available for the Department for Communities and Local Government website.

The Association for Specialist Fire Protection (ASFP) has a role to play in supporting the RRO with the main emphasis being upon education via its seminars and publications. Perhaps the most logical publication to start with is 'Ensuring Best Practice for Passive Fire Protection in Buildings'. This was developed using partial funding from the Department of Trade and Industry and contains guidance on all aspects of the design, installation and maintenance of passive fire protection. Any readers that would like a free hard copy of this document should call the ASFP on 01252 739142 referencing this article.

Other documents from the ASFP that will be of help those involved with fire safety in the UK's buildings include the 'Yellow Book' (also known as 'Fire Protection for Structural Steel in Buildings') and the 'Red Book' (also known as 'Fire Stopping and Penetration Seals for the Construction Industry'). This latter publication will be especially important for building owners/managers whose properties have had their compartmentation walls breached to run new services, such as IT cable and air conditioning ductwork. Given that virtually all buildings undergo this type of work the ASFP server (go to www.asfp.org.uk) should be working overtime with downloads and the hard copies should be flying out of the door! All ASFP documents are available as free downloads from its website.

The Association for Specialist Fire Protection (ASFP) has a role to play in supporting the RRO with the main emphasis being upon education via its seminars and publications.

In addition, the ASFP is pleased to see the mention of the use of competent persons and the Association regards this as a natural follow on from the following statement in Approved Document B Fire Safety to the Building Regulations for England and Wales:

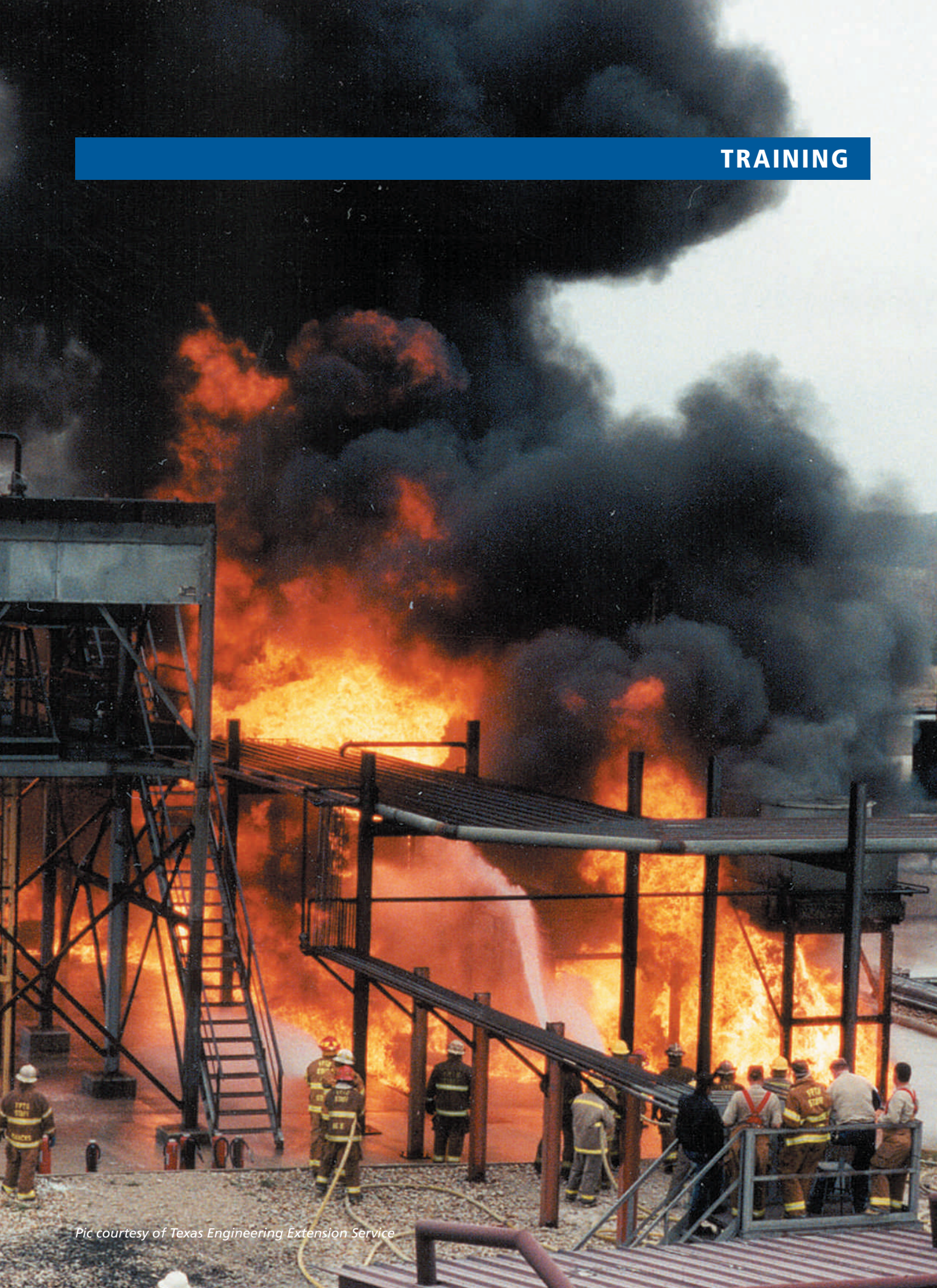
'Since the fire performance of a product, component or structure is dependent upon satisfactory site installation and maintenance, independent schemes of certification and registration of installers and maintenance firms of such will provide confidence in the appropriate standard of workmanship being provided.'

All ASFP contracting members are (or are required to become) members of a third party accreditation scheme and the use of these companies will give the Responsible Person a meaningful certificate of conformance upon the completion of any work.

With the move towards a fully 'risk assessed regime', enforcers and 'Responsible Persons' will need all the help they can get to effectively discharge their duties. The use of guidance from trade associations should form part of this package of assistance.

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Students prepare to extinguish a hydrocarbon fire at the Advanced Fire Training Center. Pic courtesy of Saudi Aramco



Saudi Aramco's Advanced Fire Training Center

Protecting the world's energy is no easy task but it is one that the Saudi Aramco Fire Protection Department (FrPD) takes very seriously. Recent events around the world have clearly demonstrated the volatility of crude oil prices when there is even the remotest perception that the supply may be threatened.

By Gerald Smith

As guardian of the world's largest proven crude oil reserves and the complex infrastructure that produces, refines, stores and transports the oil and gas; FrPD is vital to the continuing success of the Company. A fire or other emergency that cripples or gives the slightest perception of crippling a Saudi Aramco oil facility has immediate ramifications on the world crude oil prices and economy.

To shoulder this tremendous responsibility, the FrPD provides a staff of 1300+ employees to provide 24-hour coverage to Company facilities that span across the entire Arabian Peninsula. The range of assets FRPD protects is immense. There are exploration operations, oil and gas processing plants, offshore facilities, pipelines, bulk storage facilities, marine vessels, airports, and the employee communities. The communities are self-contained cities and have all of the community assets protected by any municipal fire department.

The community occupancies include housing, schools, hospitals, stores, theaters, utilities, and warehousing along with the large administrative complexes for the given area.

While all fire departments should be ready for any type of call, nowhere is this truer than at Saudi Aramco. To prepare the Fire Protection Department staff for any eventuality in this diverse response environment, a high degree of training is vital. At the Fire Department Instructor's Conference held recently in Bahrain; Saudi Aramco's Executive Director of Safety and Industrial Security, Abdullah, M. Al-Ghamdi, commented on the education programs for Fire Protection Department members in his keynote address, "Many years ago, the Saudi Aramco Fire Protection Department recognized that the degree of success expected of the department could be directly correlated to the level of training its members received. We continue to invest heavily in the education of our personnel."

Integrated Process Complex. Pic courtesy of Saudi Aramco



The education provided to the staff takes on a wide array of formats. FrPD personnel are sent abroad to obtain undergraduate and graduate degrees in various engineering disciplines, fire science and other collegiate fire protection programs of study. The Department operates 14 fire training fields around the Kingdom so that the practical application of fire training is readily available. The Department also sends numerous personnel to the various fire protection conferences held around the globe. To meet the training demand, the Department operates the Training and Development Section that is responsible for the coordination and delivery of all courses and programs necessary to address the sizable educational requirements.

To reduce out of Kingdom travel for training, the Section has for many years operated a Fire Training Center at its headquarters in Dhahran that offers courses such as Basic Firefighter, Fire Officer, Haz Mat, Rescue, and Aircraft Firefighting. This facility provides both the theoretical and practical application of the emergency response topics delivered. While this facility performs admirably and delivers impressive training totals each year, the level of live fire projects in the industrial arena has been a source of concern.

In a self-assessment study performed by the Department approximately six years ago, it was revealed that while the Department had no shortage of fire training facilities, none of them provided the level of challenge necessary to ensure the readiness of the Department to respond in a coordinated manner to a large scale event. The study indicated a strong need for a new fire training facility that could meet three criteria:

- 1** Provide scenarios so realistic as to approach what crews might actually face at a large scale industrial emergency.
- 2** Provide scenarios that address the full breadth of the assets the Department is required to protect.
- 3** Offer curriculum certified by an internationally recognized agency.

Given these findings, it was immediately apparent that a new fire training center would need to be constructed and that the firefighting evolutions would be of a scale far surpassing anything in existence in the Kingdom or even the region. It was quickly evident that this project would represent a huge investment on the part of the Company both in terms of funding and

staffing. The FrPD prepared a proposal and submitted it to the Management Committee. The proposal was enthusiastically embraced by the Management Committee and the project given life. The facility also received its name: The Advanced Fire Training Center (AFTC).

In August of 2000, the design phase began. The design parameters included the following:

1 A structural firefighting complex that represents the multiple types of occupancies found within Saudi Aramco including marine and offshore.

2 An industrial complex that represents a multi-level processing unit such as may be found in a refinery, gas plant or Gas Oil Separation Plant (GOSP).

3 A storage tank scenario.

4 Small scale fire training evolutions for plant operator training.

5 Actual industrial fuels.

6 Minimal environmental impact.

7 Infrastructure that allows self-reliance.

8 Compliance with NFPA 1402.

9 Built-in safety features.

10 Long life span.

Once the rough order of magnitude design was complete, the site for the training center was selected at Ju'aymah in the Eastern Province. The site offered numerous advantages including its proximity to Ju'aymah Gas Plant and Ras Tanura Refinery. The AFTC was designated to assume the plant operator fire training for these two sites allowing the consolidation of their fire training fields. Additionally, the Ju'aymah Gas Plant would be able to support the AFTC with infrastructure such as waste water treatment, raw and sweet water and butane for burn fuel.

Some 30,000 man hours of design time was spent engineering the AFTC during which time several specific issues required attention. For example, the structural stability of the industrial process unit was a primary concern. This facility would be exposed to multi-level fires using kerosene, gasoline and butane. For both a safety and durability standpoint, it was important that the structure be designed and built such that it could withstand the long term effects of fire training. A comprehensive thermal dynamics study was required. The Department design team enlisted the assistance of the King Fahad University of Petroleum and Minerals Engineering Department. Through this cooperative effort a system for water filled steel structural members coupled with a full footprint sprinkler system was designed and included in the construction proposal.

The final design package included an industrial process complex, an integrated structural complex (inclusive of marine fire training), a storage tank complex and the requisite infrastructure necessary to operate the site. The final design was thoroughly reviewed throughout the company by departments such as Loss Prevention, Engineering and Environmental and approved. The project was



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View of Advanced Fire Training Center showing from right to left – Integrated Process Complex, Fin Fan Cooling project, Tank Fire Project, and Integrated Structural Complex. Pic courtesy of Saudi Aramco



released for commercial proposals and the contract awarded.

In April of 2003, construction of the AFTC began. It was also at this time that one of the original criteria for providing an internationally recognized and accredited curriculum was addressed. Through a contractual agreement with Texas A&M's Emergency Services Training Institute, 62 curriculum packages were purchased, of which 26 offered Pro Board accreditation. This tactic allowed the AFTC to quickly acquire curriculum with which to offer immediately upon completion. The project team also began the task of providing staff to the training center. Realizing that providing quality fire training is about much more than the curriculum and the physical facility, the FrPD developed a high caliber instructional pool. Says Executive Director Abdullah M. Al-Ghamdi recently, "Again we did not settle for anything less than the best. For staff we recruited top experts from around the globe and matched them with the top talent we have here in our fire department to produce what I believe is the best fire training staff in the business."

The massive facility completed construction was declared mechanically complete on January 31, 2005. All of the design and construction goals had been met. The facility then underwent commissioning and start-up for the next six months in order to become fully operational. When the construction crews vacated the site, a world-class fire training center awaited the proud members of the FrPD. The major components include:

Integrated Process Complex

General

4,988 square meters of floor space spread over five levels

Flooded steel structural members and full footprint sprinkler system

Realistic reclaimed process equipment throughout

Training Applications

124 separate fire points

Spill fires and three-dimensional fires

Live working valves

Ability to expand or collapse fire in response to team tactics

Represents:

- Refinery
- Gas Plant
- GOSP
- Offshore Facility

Dedicated rescue training area

Safety and Environmental Factors

Emergency Shutdown Device

Local fuel controls on each level

Designed safe havens on each level

Redundant vertical egress

Sloping Containment

Secondary Containment

Total containment and drainage to waste water treatment facility

Integrated Structural Complex

General

4,306 Square meters: 85m long x 21m wide x 28m high (at highest point)

Seven floors in high rise, three floors in residential

Elevator shaft

SCBA maze

Constructed of steel reinforced 5,000 PSI refractory aggregate concrete

Steel clad engine room and marine deck

Class B fires in engine room and on marine deck

Class A fires throughout remainder of facility

Two standpipe systems

Training Applications

Residential occupancy firefighting

Commercial occupancy firefighting

High-rise firefighting

Marine firefighting:

- Engine Room
- Tanker Deck
- Marine Mock-up
- Heli-deck Fires

High angle and confined space rescue

Safety and Environmental Factors

Emergency Shutdown Device

Local fuel controls

Self-leveling Class B fuel pits

Wide hallways and means of egress

Multiple stairs

Total containment and drainage to waste water treatment facility



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Storage Tank Fire Complex

General

Three tanks:

- Cone roof tank (represents exposure)
- Spheroid (represents exposure)
- External floating roof tank (fire training prop)

16m diameter x 9.75 m high external floating roof tank

Variable fuel level controls allowing either seal or full-surface fire

Adjustable self-leveling controls

Stair access to top of all three tanks

Training Applications

Seal fire firefighting

Full-surface firefighting

Fixed system application

Foam calculations and logistics

High angle and confined space rescue training (from spheroid and cone roof tank)

Safety and Environmental Factors

Emergency Shutdown Device

Local fuel controls

Sloping Containment

Secondary Containment

Total containment and drainage to waste water treatment facility

Classroom and Support Building

Classroom Building – General

Five classrooms

Computer-based training back-bone

Installed AV equipment in each classroom

Dining facility

Prayer Room

SCADA monitoring system

Support Building – General

Fire apparatus bays

SCBA refill

Fire extinguisher refill

Locker room

Showers

Support Systems

Firewater System

10,000+ GPM closed loop system

1,050,000 gallon firewater tank

Fixed monitors, hydrants and manifolds

Wastewater Treatment

365,000 gallon underground contaminated water tank

Crushed shell media water treatment skid

Recycled water

Fuel Distribution

4,000 gallon gasoline tank

4,000 gallon kerosene tank

5,000 gallon butane tank

Redundant pumps on gasoline and kerosene

Master fuel control center

Local fuel valves

Emergency shut down

Programmable Logic Controller

Programmable system management for:

- Firewater system
- Wastewater system
- Make-up water
- Fuel system

Back-up diesel generator

The facility began pilot courses in May of 2005. From just nine courses a little over a year ago, the curriculum offering at the AFTC has since expanded to 21 separate course titles. In the past year some 700 students representing the FrPD, Marine Department, Offshore Department and Plant Operations have attended courses at AFTC. The 700 students signify 20,000 contact hours of instruction. Additionally, over 40 FrPD members have been certified to Pro Board standards as Instructors. Third-party certified training delivered in-house is a milestone achievement for the FrPD.

Another milestone achievement for the AFTC came on May 17, 2006 when the facility was officially inaugurated. Attending the ceremony was Saudi Aramco President and CEO Abdallah S. Jum'ah. He commented to the attendees from the Department that they play a vital role in the world economy by their vigilance in protecting Saudi Aramco's many energy assets. "Today," he said, "Saudi Aramco is enjoying a reputation of gold around the globe. The world is putting a lot of trust in our reliability. Advanced training like this does a lot to enhance our reliability."

While the AFTC has only been operational a short time, the Department is already looking forward and exploring avenues with which to further maximize the benefit of the facility. Long-time proponent and visionary of the facility, FrPD Manager, Ali A. Mokhtar sees the AFTC playing a vital role in preparing the workforce of the future. Knowing that firefighters in the future will be very reliant on advanced technology, he states, "This facility will enable us to provide our firefighters and plant operators with the best and highest quality training in fire, rescue and emergency response management".

In June 2006, the AFTC got yet another piece of good news. During the original proposal phase of the project, the Management Committee tasked the AFTC staff with exploring the possibility of offering training for a fee to third parties. Fee generation aside, this prospect offers many advantages to the FrPD such as scheduling flexibility, diversity of courses and mutual aid benefits. Additionally, offering this service to its industrial neighbors in the Kingdom supports the company imperative of good citizenship and stewardship. After two years of working out all the particulars, the Management Committee approved the AFTC's proposal to begin offering training services to interested third parties within the Kingdom. The AFTC hopes to expand the third-party training program to out of Kingdom industries within the next two years.

The future for the AFTC looks very bright and very busy. New initiatives include partnerships with additional schools and accrediting agencies; expanding the existing curriculum; initiating and growing the third party program; and of course, continuing the provision of training to Company personnel.

Saudi Aramco firefighters know they have the rare opportunity to make a difference that the world will notice. They know what kind of business they protect and that their success depends upon being prepared when the time comes. The AFTC provides them what tools and equipment alone can not: the know-how and experience to succeed.

IFF

Gerald Smith is a Fire Protection Advisor for Saudi Aramco's Fire Protection Department. He has been in the fire service for 25 years and has served as a firefighter/paramedic and training officer for the Montgomery (AL) Fire Department. He has a Master's degree in Training and Development from Louisiana State University where he also served as Assistant Director at LSU's Fire and Emergency Training Institute.



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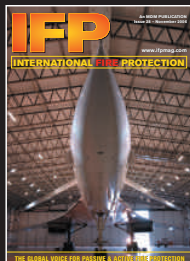
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Training Industrial Firefighters:

Some perspectives



By Frank Bateman

"Nothing happens until somebody sells something"

Having spent a good part of my life in the sales profession, I believe this statement to be true. I also believe this statement to be true for everything in life, especially education and training. Fire training is an excellent example of convincing someone that your product (information, technique, application method, etc.) has value (make their life easier, keep them alive, save others, etc.) and that they should purchase it (spend the time and effort to achieve the learning objective).

"Those who can, do – those who can't, teach"

Without going into why this saying resonates with many of us, the fact that many believe this statement, puts training in a bad light. While most associate the saying with traditional educators, unfortunately it carries over into the area of industrial training. Some companies do their part to perpetuate the problem by staffing their training departments with underachievers (some managers

have even admitted that they have transferred people to training that they would like to terminate, but couldn't).

Success is not assured even when management understands how valuable good training is to property conservation, the health and safety of their employees and environmental conservation. Successful training programs take time and hard work to develop and even more hard work to sustain.

So, if the above is true, why would anyone want to be involved in training? For me, it's a combination of things but mostly it's because I love doing what I'm doing. I'm constantly asked why I'm still working when I could retire. The answer's always the same, "I'm having too much fun".

So, just what is a successful training program?

Personally, I am not a 'touchy-feely' kind of guy, but, I am human and respond more favorably when I'm treated as a professional. I perform at

Pic courtesy of Kidde Firefighting National Foam



my best when excellence is expected and appreciated. When forming an instructor team, I try to enlist the talents of professionals who share my commitment to training. They must share my belief that the product we provide is important. It's more than 'nice to know' information. How our students are trained can mean the difference between life and death for emergency responders. It can also mean the difference between an organization being viable, or going out of business as a result of an incident with great loss of life and property loss. Folks who consider these statements 'a bit much' or 'a little corny' (boy, did I date myself with that statement) are usually not good candidates for an instructor team.

To be adequately covered, instructor qualifications is really a topic for another article. In my opinion, universally recognized instructor certification is long overdue and I applaud the efforts of all

those involved in elevating firefighting instructor qualifications to that of other disciplines. It can't be overstated, however, that this is only part of what makes a good instructor. For example, except for the military, I can't think of a profession where experience (been there, done that) is more important to the credibility of an instructor than in firefighting. The best instructors use their experiences to enhance their training, not to show off, or as a crutch (over reliance on war stories to cover for lack of preparation). The ability to deal with people (students, fellow instructors, etc.) is another crucial ingredient in the makeup of a good instructor.

Whether the team consists of two, or as many as 40 instructors, all must be in concert in their approach to achieving teaching goals. Nothing erodes students' confidence faster than one instructor contradicting another's information on a subject.



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Example: I coordinate two flammable liquid firefighting courses for Kidde Fire Fighting each year at Texas A&M. Our guest instructor cadre includes the 'best of the best' found anywhere in the world for this type of training. We're a close knit team of about 40 fire fighting professionals with truly amazing resumes. It's extremely gratifying to have expert instructors from all parts of the firefighting spectrum volunteer their time to conduct state-of-the-art training because they believe in our school. Whether it's an FDNY veteran Rescue captain, an oil refinery/chemical plant fire chief, a municipal FD B/C who's also a USAR team leader or a U.S. Coast Guard captain who's an expert in marine firefighting, we've got it all and students appreciate it.

Simply stated, if you're good you've got an ego which, properly harnessed, is a resume enhancement. In most cases, there are different, approaches/philosophies/techniques/methods in teaching a subject that are considered acceptable. In our case, what's really important is our team recognizes that, while their preferred method (one that might even be used in their plant or department) is not in use at our school, the one we're using is acceptable practice, does not compromise safety, and provides continuity of approach in achieving the learning objective.

As obvious as it may sound, relevance is the key to industrial fire training. The risk analysis process is a great tool to identify what the organization needs in the way of training. Once we know what can go wrong, programs can be developed to prevent or reduce the impact of the occurrence of such an incident. Of course, the type and amount of training should be customized to achieve the program's goals.

In training, as in most areas of business today, 'outsourcing' is way of life. This cost cutting trend has had its effects in training. More and more, it's hard to find an organization able to meet its training needs in-house. Still, sending personnel to remote training sessions is a costly endeavor in many ways. Therefore, to maximize the return on the organization's investment in training, it makes good sense to do as much training as possible at home even if it means importing training expertise when necessary. Subjects such as mobile apparatus, fixed systems, hazard analysis via plant familiarization tours or fire training props (generally of the type used for fire extinguisher training), etc., are candidates for in-house training.

When organizations can't satisfy training needs at home (inability to create realism for students, etc.), there are offsite venues that can help. Unfortunately, when it comes to hands-on fire training even at the best live fire training venues, realism is a relative term. Small inadequate props, inability to use flammable/combustible liquids and/or foam at some locations may be less costly but the reduction in realism makes them no bargain. Also, beware of the over confidence that sometimes results from continuously extinguishing small fires which present no challenge to firefighters. Nothing annoys me more than a trainer who lets his/her students believe that extinguishing a flammable liquid fire containing a 'thin skinned' fuel load resting on a water bed using water/foam at too high an application rate is the real thing.

There are two popular options for fulfilling offsite fire training needs. First, in larger organizations, it's sometimes possible to take larger groups (teams, brigades, etc.) along with their instructors and equipment to a facility with adequate training capability. At the better facilities, they can select the firefighting props that most closely simulate the hazards in their plant and rotate teams accordingly. A second option is taking advantage of a large variety of structured classes provided by others. This option is popular with smaller organizations who don't have the in-house staff or budget to

take advantage of option number one. When sending smaller groups to off-site structured classes, one of the biggest challenges is to select those that contain what a department needs with as little of what is not needed as possible. As costly as this type of training can be, the last thing anyone wants is disgruntled employees returning from a class that had little to do with the training they need.

Example: Because the training I conduct varies in type (classroom, live fire evolutions, table top exercises, equipment deployment drills, etc.), and scope (basic, advanced, refresher, etc.) and audience type (public and private fire department, military, maritime industry, fire protection system designer/engineers, code enforcers, etc.), I've found it essential to develop training modules that can easily be adapted to fit just about any group or combination of groups.

This concept fits ideally into our courses at Texas A&M. We introduce information from appropriate subject modules in the classroom that is then reinforced, that day, on the fireground. Each module is adapted to our primary target audience (emergency responders). For example, when we discuss fixed systems, we focus on what responders can expect (both good and bad) and how to deal with the consequences of system actuation or failure. Our engineering seminars have a different target audience and spend a great deal of time developing design material that responders usually consider as 'nice to know'.

The Kidde Fire Fighting course curriculum at Texas A&M has continually evolved in order to take full advantage of the facility. We have steadily expanded the types of, and increased the time spent, fighting fires. While this has greatly improved the quality of the teaching product, it has also greatly increased the cost of the school. The A&M course is conducted so that Kidde Fire Fighting can fulfill its commitment to our customers which is:

Training Mission Statement

"All the technology and fine craftsmanship in the world is valueless if the products of that endeavor are used incorrectly. Therefore, to those ready to sacrifice all while saving life and property, our commitment is to provide the finest training possible to the dedicated professionals of the fire service."

In the process of living our Mission Statement, Kidde Fire Fighting can only afford to spill so much red ink. This has left me with few choices – reduce fuel consumption and with it, the value of the training, or pass the fuel cost on to our customers. Because I simply refuse to lower the quality of instruction, I was worried that we would lose customers. The fact that we are filling both sessions each year is evidence that choosing quality was the right choice!

While some others boast of high numbers of attendees at their annual session, I've chosen to accommodate our customer demand by convening multiple sessions. Once again, the reason is quality. History has shown that, at Texas A&M, most learning takes



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place when firefighting evolutions are extinguished with teams of 15-20. With four teams of this size, all participants are occupied productively during each burn. With a full agenda of both day and night burns, I've never had a complaint about the lack of size, or number of burns.

To satisfy the wide variety of firefighting needs of attendees, I have added breakout sessions that are conducted at the end of the first day. ARFF/roadside type fires, pump operator refresher, Class 'A' foams for interior structure fires are examples of these 'extra credit' sessions. If students find that the breakout sessions don't suit their needs, they can leave the firegrounds at 5:30pm when their team has completed the regular rotations.

Before I end the description of curricula or course agenda, I need to mention my biggest pet peeve. When an organization accepts money for training, it should not violate that trust by turning the sessions into selling presentations. As a result, I enforce a strict policy that purchased training will be provided in a 'No Sell Zone'.

The product of any training is perishable. With every passing day, the process of skill erosion takes its toll. Factory workers who perform the same manipulative skill throughout the workday don't need refresher training. Firefighters, especially plant fire brigade or volunteer firefighters, may only have the opportunity to reinforce skills learned during training. The training programs need to be designed to accommodate the needs of firefighters with different levels of experience who must perform as a team at an incident.

Example: At every session we conduct, attendee experience covers the entire spectrum of years of service and fires fought. In the classroom, this is no small challenge because you have to keep the 'old timers' awake while you're bringing the rookies up to a level where you can cover the material needed to conduct live fires. Also, before we light the first fire, refresher sessions are conducted in such areas as hose handling, water and foam

application techniques, SCBA donning and doffing. We find that while many will complain (especially the 'old timers') about these sessions being a waste of time, they all need it.

Much has already been covered on the importance of venue for hands-on training. Even the largest facilities with the widest variety of props is limited in what it can provide. The fuels permitted for firefighting training at the few remaining live fire training schools must be 'smokeless'. Depending on the fuel used, the fires may or may not simulate reality.

Example: While there are many locations that offer live fire training on flammable/combustible liquids, we use Texas A&M's facility in College Station, TX for the following reasons:

- 1 The focus of our school is foam. To properly reinforce material presented in the classroom, we need liquid hazards for Class 'B' fires and ordinary combustibles for Class 'A' fires. So the venue we use must permit both types of fires and allow the use of foam during extinguishment.
- 2 Prop selection. We like to run four rotations and the large number of props allows us to reinforce techniques with different types of fires.
- 3 Prop variety. At one location, we can extinguish engine room and cargo deck shipboard fires using distributor nozzles and high expansion foam, structure fires using Class 'A' foam, while at other props, water is used to capture flowing liquid or LPG fires so that valves can be closed.

Conclusion: Define something more important than training! Properly conducted, it could save your life, your job and your community. Firefighters who attend training in the 21st century are smart. Don't insult them with training that wastes their time. Don't waste the money of the sponsor by delivering a substandard training product. Those who don't agree with this, should stay away from training.

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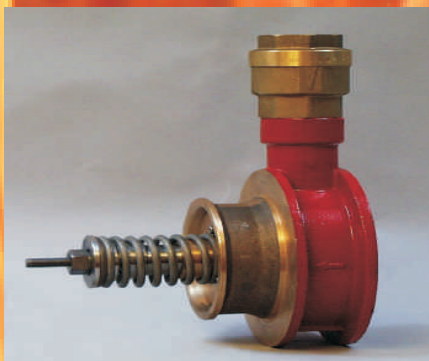


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Devon Fire & Rescue's Breathing Apparatus & Fire Behaviour Training Unit



By Mark Bathard

Sales & Editorial
Manager, International
Fire Fighter

International Fire Fighter's Sales & Editorial Manager, Mark Bathard spent a day with Devon Fire & Rescue's acclaimed Breathing Apparatus & Fire Behaviour Training Unit to experience a day in the life of an instructor.

The day started at 8.30am with BA instructor Rowan Delasalle picking me up from my home and driving to the other side of Exeter the training unit is based at Exeter airport courtesy of the airport fire service. The first and most important part of the day was the mandatory cup of tea (or was that three) and being introduced to the other instructors who were also going to be keeping a close eye on me to make sure that everything went smoothly. After the morning cuppa, I was given a brief rundown of how the day would go. Firstly we went into the classroom with the rest of the students and learnt about the behaviour of fire in a compartment

Devon Fire and Rescue has struck up a good training programme with the much acclaimed Raddnings Verket Swedish Rescue Services Agency who have pioneered this particular aspect of teach-

ing fire behaviour. The instructor started by telling us that this course was aimed at teaching future instructors the rudiments of compartment fires and explaining such things as backdrafts and the presence of superheated gases which occur in the overpressure above the neutral plane. The object of the exercise is to learn about the dangerous elements of a compartment fire, witness a live burn demonstration and then, a live burn attack scenario.

Students work in pairs and each do four demonstrations and four attacks. All the other students would be in the container at the same time effectively acting as raw recruits whilst the two student instructors would be graded on their capabilities to safely instruct, point out the features of a developing fire and "paint" the fire and gas cool using a high pressure hose reel

Attack scenario fully involved



creating minimum steam thus ensuring the safety of fellow students.

Whilst the classroom sessions were going on, the senior instructors who were also acting as safety personnel were busy preparing the containers for the afternoons live burn scenarios. Sheets of chipboard are used for each burn. The demo burn normally consists of three sheets on each side of the container and four sheets attached to the roof. The attack scenario uses up to seven sheets attached to the ceiling.

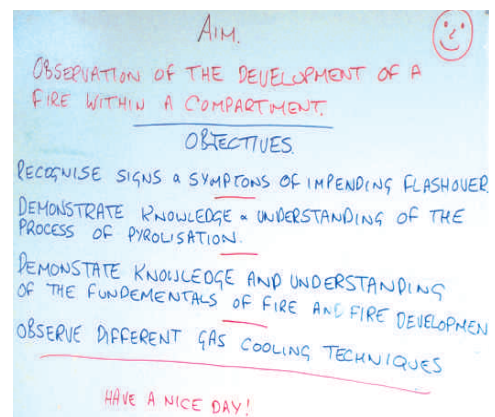
By this time it had dawned upon me that a day observing the life of an instructor also meant I was to get kitted up and get fully involved with the live burn demo's and attacks, lunchtime had arrived and a very welcome cup of tea or two was again the order of the day. During the lunchtime interval, BA instructor Delasalle had my kit ready including a very welcome ice vest and then proceeded to instruct me on the use of their SCBA sets. Devon Fire & Rescue have for many years been using Interspiro sets. Delasalle reassured me

that these sets take a lot of abuse at the training ground and were 100% reliable, he personally recommended their safety and assured me that that there was nothing to worry about.

The time had come to be kitted up with Delasalle going through the safety checks and making sure that the SCBA was comfortable to wear and not strapped to tightly. I was led to the first container which would be for the demo. The two instructors were busy giving the remainder of the students their safety brief before entering the container to start the fire. This is done with a gas burner and once the fire has caught, the instructor leaves the container. After about 5 minutes the instruction to enter the container are given. I follow behind with Delasalle who is there to drag me out if I feel uncomfortable or get into any difficulties. I sit to the side of the container while the lead instructor is at the front using hand and arm movements to demonstrate the behaviour of the fire as well as point out the neutral zone. While this is all going on, I notice through the smoke



Instructors preparing to enter attack scenario





Quality reading at lunchtime

that one of the senior instructors from Devon Fire & Rescue, has a board and is marking down any comments he might want to make at the de brief after the scenario has ended.

All in all, I was in this container for about 20 minutes and not once did I feel uncomfortable considering all the gear I was wearing, the ice vest certainly came into its own. Upon exit from the container, and a safe distance away from the fire, the masks came off and we were all instructed to drink plenty of water and take five minutes to relax and then head into the classroom for the de brief. During this session, senior instructors were asking the students if they thought that the demonstration went well and if they personally thought the objectives had been achieved, they were also encouraged to offer constructive criticism.

We were now approaching the end of the day and another group were in the second container doing an attack scenario, Delasalle told me to keep my gear on as when the group were to exit, I was going to be taught the art of using a hand line without using too much water. After the students had exited from the attack scenario, Delasalle and myself entered the container which although not quite fully developed was still an impressive sight to a greenhorn like myself. Upon entering, I was instructed to aim the nozzle above my head and give a very short sharp spray which would cool the area immediately above our heads. Next, adjust the nozzle

and give a short two second spray to push back the flaming combustion. The idea was to wait for a few seconds to see how the fire would react to this and if necessary, repeat the same process.

In conclusion, I found the day at the training establishment extremely educational and although I have been in the municipal and industrial fire industry for twelve years, I never really have experienced anything quite like what I saw on this day. A big thank you go to all the instructors at Devon Fire & Rescue BA Training for making sure I lived to tell the tale, I would strongly recommend any department who are considering training in this field, to contact The Breathing Apparatus & Fire Behaviour Training Unit for some expert advice.

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Preparing the BA sets for the demos

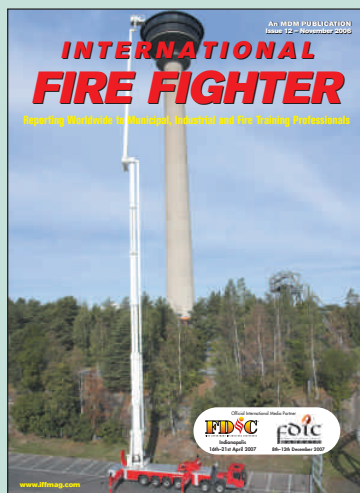
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